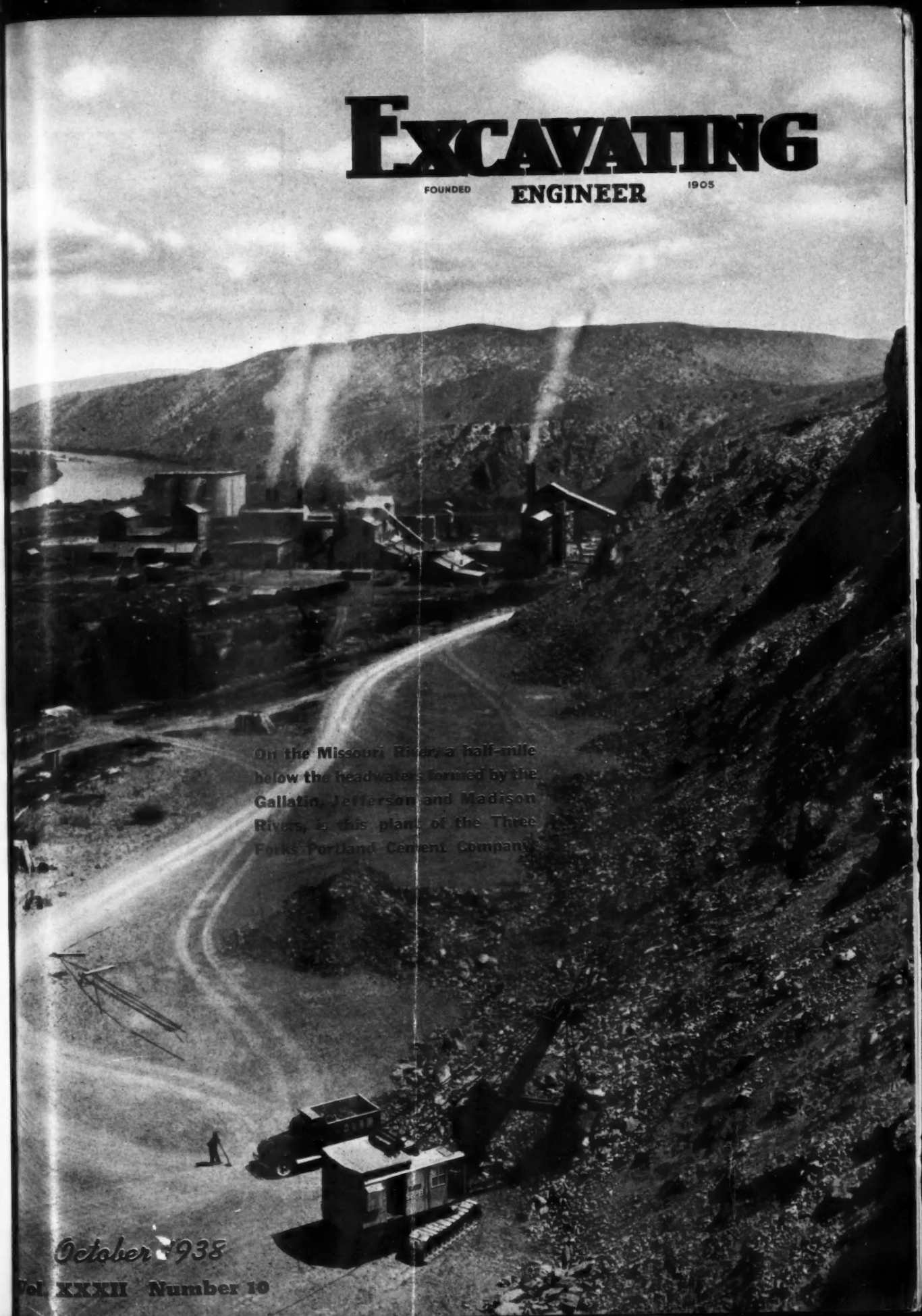
EXCAVATING ENGINEER

FOUNDED 1905



On the Missouri River a half-mile below the headwaters formed by the Gallatin, Jefferson and Madison Rivers, is this plant of the Three Forks Portland Cement Company.

October 1938

Vol. XXXII Number 10

MONEY SAVING *Accessories*

Handy Hoist

Here is a big little helper for any hoist job around shovel or dragline, repair shop, plant, mine or pit. The Handy Hoist is a one-man tool — easy to hang, easy to handle, easy to work. Pulls up or down or sidewise, and can be readily taken anywhere on the job. Five sizes — ¾ ton, 1½ ton, 3 ton, 4½ ton, and 6 ton. Write for descriptive literature.

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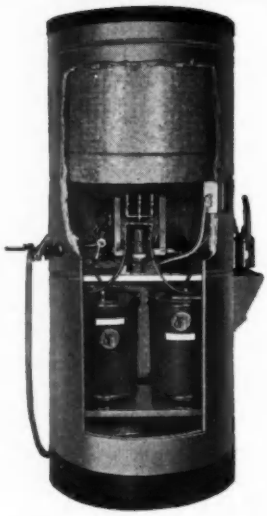
Beco Blocks and Linings take the heavy loads at the increased speeds demanded of modern excavating equipment. These Beco products are durable and tough—that's why replacements and adjustments are less frequent.

Rope Sockets

Bulldog wedge rope sockets never fail. The harder the pull . . . the tighter the grip! Attachment is easy and quick and directly in line with pull, eliminating costly kinks. Made in a dozen sizes and four different styles. Write for bulletin.



New Bucyrus Oil Reclaimer

With the NEW Bucyrus Oil Reclaimer, used oil is reclaimed by a simple washing and filtering process at an average cost of about nine cents per gallon. It is a scientific fact, arrived at by leading research engineers and chemists throughout the country, that engine-use breaks down only the weaker and unstable molecules of your oil. These constitute about 10 per cent of the oil—the other 90 per cent, the strongest particles of the original oil, can be separated and cleaned for re-use by the NEW Bucyrus Oil Reclaimer.

Investigate the possibilities of the Bucyrus Oil Reclaimer before you discard another quart of used oil.

Wire Rope

Selected by the men who build your excavating and drilling machinery, Bucyrus-Erie rope has the special features that spell better performance. B-E wire rope has a uniform high quality, and comes in the right sizes, types, and construction for your exact needs. Send for wire rope bulletin.

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No matter how unusual your "push, pull, clamp, or straightening" problem may be, BECO Jack is the tool that gives you a safe, sure, and proved means of doing the job better. The drop-forged nuts, lever socket, ratchet and screw are heat-treated so that a welding heat will not damage the jack. Screw lengths — 10", 12", 14", 16", and 18". Capacity 35,000 lbs. Send for bulletin.

T 13

BUCYRUS - ERIE

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

EXCAVATING ENGINEER

FOUNDED 1905

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Three Forks Portland Cement Company quarry face and plant are shown on this view. Before loading, rock is drilled with churn type rigs. Average haul from loading shovel to plant is 1800 feet.

Erie Sand & Gravel Company **505**

New 1¼-yard clamshell is yard handyman in lakeside plant. Fine sand and gravel dredged from Lake Erie's bottom furnish this company's "raw material."

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Government funds finally bring Wisconsin's largest flood control project near completion. Channel-straightening and a control dam north of the city of Milwaukee feature work.

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These interesting articles will appear in an early issue of EXCAVATING engineer. Watch for them.

Early Gold Dredging

Here's the story of the first days of mining placer gold with dredges in the Montana deposits.

County Road Work

Clay County, Missouri, finds 3½-yard scraper a handy all-around tool for road work.

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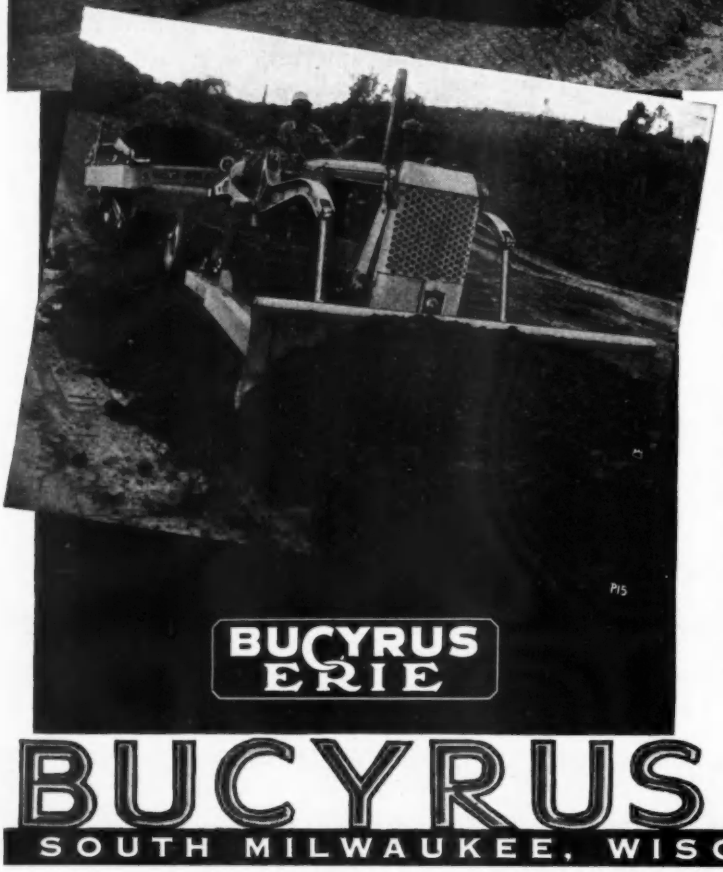
GRADING A ROAD, *Single-handed*



ONE MAN, the tractor operator, handles the full range of dirt-moving on a road job—from blazing the trail to completing the grade—when his tractor has a Bucyrus-Erie Scraper hitched to its drawbar and a Bucyrus-Erie Bullgrader mounted in front. On the job illustrated here, a front-end oil pump mounting furnishes hydraulic power for the Bullgrader blade, and a drum winch at the rear of the tractor powers the single cable that controls the 4-Wheel Scraper. In dual service with the Scraper, the Bullgrader levels fills, maintains hauling roads and finishes grades. The blade may be angled to the right or left for smooth, accurate grading, or set straight across for bulldozing. Write for complete details on Bucyrus-Erie's modern tractor equipment, or see your nearest International Industrial dealer.

BUCYRUS - ERIE

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

Twenty-four-hour-a-day operation for this International Model T-40 TracTracTor, building truck roads in the pit and pushing ore to the shovel at the stock pile in this iron mine near Virginia, Minn. The Mesaba Construction Company of Virginia owns this International. They say it is the fast piece of equipment they have and that it is standing up better than any tractor they ever had any experience with.

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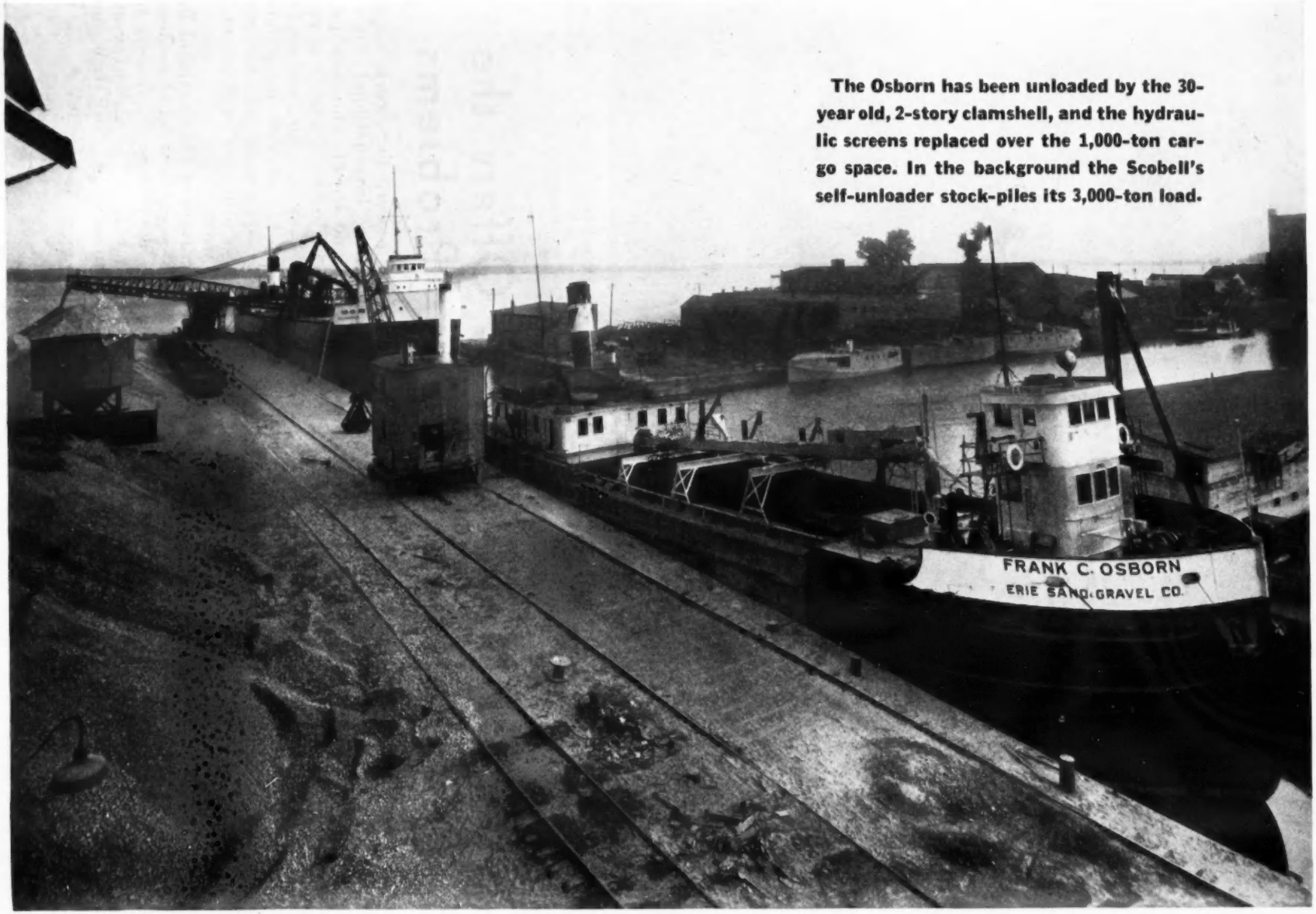


The Osborn has been unloaded by the 30-year old, 2-story clamshell, and the hydraulic screens replaced over the 1,000-ton cargo space. In the background the Scobell's self-unloader stock-piles its 3,000-ton load.

ERIE SAND & GRAVEL COMPANY

GEN. OFFICE & DOCK FOOT SASSAFRAS ST. ESTABLISHED 1866

LAKE SAND AND GRAVEL

Erie, Pa.

SAND
CONCRETE
PLASTER
ASPHALT
FOUNDRY
TRACTION

GRAVEL CRUSHED FOR ALL TYPE BITUMINOUS PAVEMENTS. SCREENED AND CRUSHED FOR ALL TYPES CONCRETE WORK

Unusually fine material for construction aggregates is dredged by Erie Sand & Gravel Company 16 miles from harbor of Erie, Pennsylvania

ABOUT 250,000 tons of unusually high quality sand and gravel are shipped from the lakeside plant of the Erie Sand & Gravel Company every year, to be used for highways, building construction, steel plants, and a variety of other industries. The total output is divided approximately equally between rail and truck shipment. Excellent facilities for the former are provided by the Pennsylvania, New York Central, Nickel Plate, and Bessemer & Lake Erie railroads. Truck shipments are made in equipment owned by customers or hired for the hauling. Busy days see 1,000 to 1,500 tons going out by trucks.

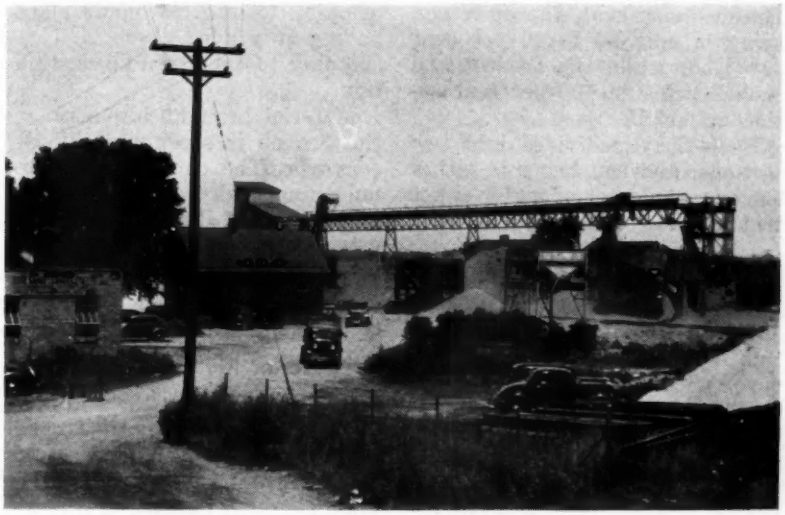
Special sands produced are shipped within a radius of 180 miles from Erie. Concrete materials cover an area with a radius of 40 miles. Shipments are made throughout the year, winter deliveries being made from 50,000 to 60,000 tons of material stockpiled during the dredging season, which runs approximately from April 15 to December 1.

Six Classes of Material Sold

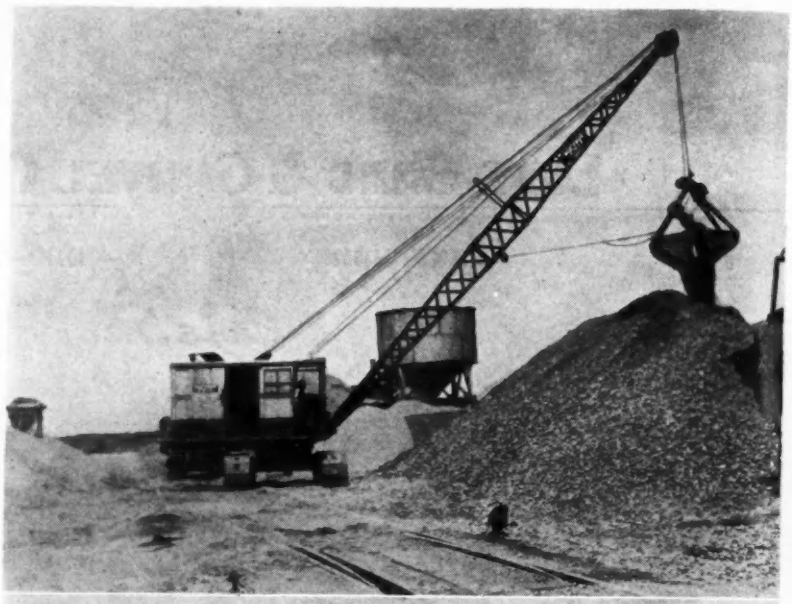
Six classes of material are sold by the company. These are: plaster sand; traction sand; asphalt sand; foundry sand; concrete sand; and gravel, ranging in size from 12 to ⅜ inches. Building construction furnishes the chief market for this material. Highway work is the second market, and industrial uses the third.

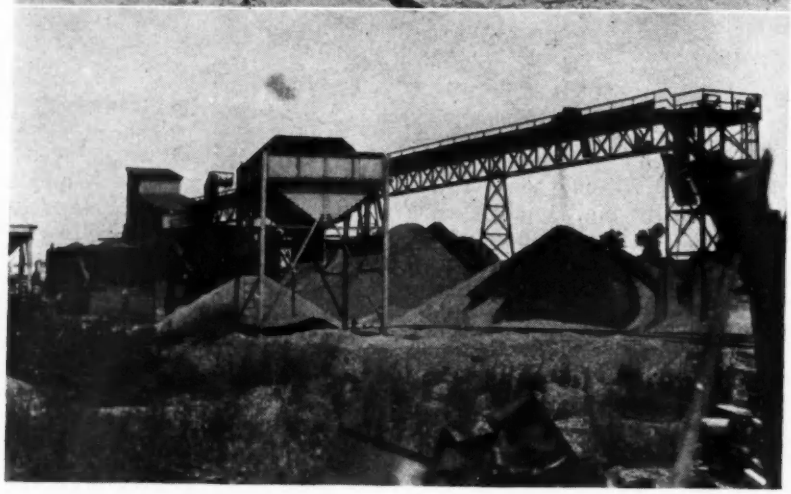
About 50,000 tons per year of crushed limestone brought to Erie from Sturgeon Bay, in 6,000-ton loads and used in bituminous road work, is handled by the company. All other material comes from deposits in Lake Erie about 16 miles northwest of the city of Erie, Pennsylvania, where docks and plant of the company are located. This sand and gravel is the soundest ever found in the Great Lakes

● At left is the well-equipped shop which keeps equipment in shape. To the right of this is the company office and scale for truck shipments. In background are loading hoppers and conveyor leading from 120-ton-per-hour crushing and screening plant.



● Top: Serving as the yard service machine, the 29-B, equipped with a 1¼-yard Williams bucket handles an average of 200 tons per hour. Bottom: Behind the hopper for truck-loading in the foreground is the crushing, screening and washing plant, and the 267-foot conveyor which stock-piles washed gravel.





and used for construction aggregates.

Lake Bottom Furnishes Material

Material is dredged from the lake bottom by two steam vessels belonging to the company. The Joseph S. Scobell is a 300-foot vessel with a 3,000-ton capacity. It is equipped with two 16-inch American Manganese pumps, and 85 feet of suction pipe. The second vessel, the Frank C. Osborn, is 160 feet long, has a capacity of 1,000 tons. It is equipped with one 16-inch Morris pump and 85 feet of suction pipe. Dredging depth at which both boats operate is 60 to 70 feet. A total of 49 men make up the crews of the two vessels.

Patent Screening Method

Each boat is equipped with a Gerken patent hydraulic screening method for which the Erie Sand & Gravel Company has the sole rights. This method permits separation and grading of the sand and gravel right on the boats. Undesirable material goes right back into the lake, and loading and grading is one operation. An idea of the value of this system can be gained when you realize that ordinarily out of 1,000 tons dredged from the lake bottom, only 300 to 400 tons are usable. The ordinary boat, therefore can bring in only 30 to 40 per cent pay load, while the Osborn and Scobell bring in 100 per cent usable material.

Each boat is divided into two sections, and can bring in either one or two classes of material per trip.

Saving Time in Lake Port Shipments

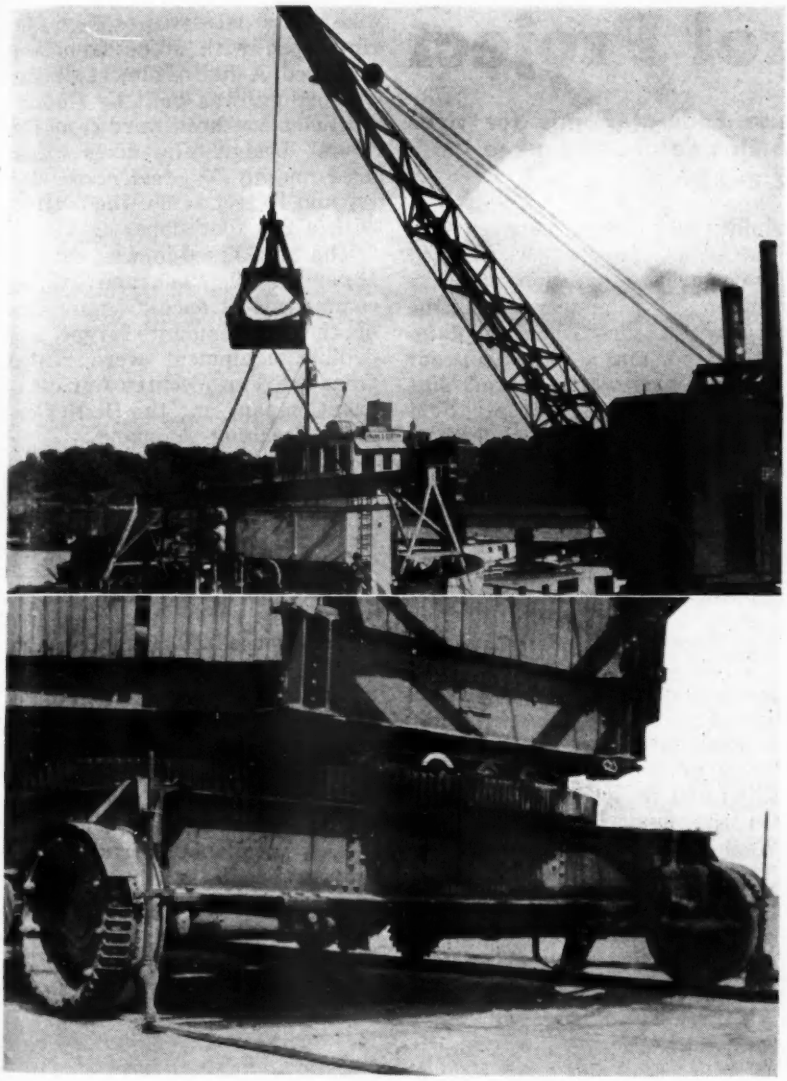
The Joseph S. Scobell is a self-unloader, equipped with both clamshell and 30-inch belt conveyor with a 110-foot boom. This equipment can unload 3,000 tons in 9 hours. With its grading and unloading features, the Scobell can and does furnish sand and gravel direct from the lake deposits to Cleveland, Sandusky and Detroit, avoiding the expense of bringing it into the home plant, having it graded there, and reshipping to the eventual destination.

Material brought into Erie by the Scobell is stock-piled by the conveyor. The company has two unloading docks, on the east and north sides of its lakefront property. These docks, with an 18-foot depth of water, are the only privately-owned ones in the harbor of Erie.

Veteran Rig Unloads Boat

The second boat, the Frank C. Osborn, is unloaded by the 30-year old, two-story Williams steam clamshell shown in some of the accompanying pictures. This rig operates on wide gauge tracks which give it access to the entire dock frontage. With wind blowing stock-piled sand over the tracks, two brooms fastened in front of the wheels clear the way for the rig. With a 3½-yard Williams bucket this powerful old clamshell can unload the 1,000-ton Osborn in four hours. Before getting to work on the cargo, the clamshell lifts off the hydraulic screens and the braces which hold them over the cargo space. These are stacked on the dock and replaced by the Williams when the material has been unloaded. The two-story feature of the Williams gives the operator a full view of the cargo space.

This rig also works on re-handling material on the docks between



● Before unloading the Frank C. Osborn, the 2-story steamer removes the steel framework which holds the patented screens in place. This rig unloads the 1000-ton capacity Osborn in four hours. Bottom: Stockpiled sand often blows over the wide-gauge tracks used by the big Williams steamer. Hence the permanent brooms which keep the track clear.

boats, and handles between 400 and 500 tons per hour at this work.

A second track machine, used for re-handling and shifting cars, is a Browning steamer. With a 50-foot boom and a 1½-yard Williams bucket, this machine can handle about 150 tons of material per hour.

Crawler Crane Is Yard "Handy-Man"

The yard service machine, used for filling hoppers which, in turn, load either railroad cars or trucks, is a Bucyrus-Erie 29-B. This rig swings a 1¼-yard Williams bucket on a 45-foot boom, and handles 200 tons per hour of average material. Mounted on extra wide caterpillar-type mounting, the 29-B moves throughout the yard, handling material at locations inaccessible to the track rigs. Although the stock pile setup is necessarily such that there is some difficulty in getting the machine around, it more than makes up for it in speed when it gets to the job.

In operation since the first of the year, the 29-B has had no trouble, and has been very reasonable on fuel, according to Vice-President and General Manager St. John, who says, "It will load for 50 per cent lower cost than steam rigs of comparable size."

Furnishing Washed Gravel

Screened materials brought in by the boats are stock-piled directly; then go either into hoppers or cars for shipment. Coarse material is unloaded over a tunnel from where a bucket conveyor takes it up to the crushing and screening plant. Crushed material goes to two sets of double deck screens which separate it to desired size. The plant has a capacity of 120 tons per hour of washed gravel, ranging in size from ⅜- to 4-inch. A 267-foot conveyor stock-piles the gravel. Equipment in this plant is Telesmith and Kennedy & VanSann.

An Erie Batch Plant for furnishing concrete aggregates has a capacity of 350 yards per day. It mixes three sizes which can be varied as required by specifications on various orders.

The company handles nearly all its own maintenance and repair work. Two men work full time on this, in a shop equipped with forge, two electric welding outfits and machine shop equipment.

Employes Win Safety Award

A total of 63 employees are on the payroll, which is fairly constant. Five or six of the employees have been with the company from 20 to 30 years, having "grown up with the business." The experienced crew proved its value in the recent safety contest conducted by the U. S. Bureau of Mines. The men were simply told the company was entering the contest and the record put up to them. The result of 68,400 man-hours worked without a lost-time accident, which put the company fourth in the list of winners, was possible only through cooperation of a crew that knew its work and could do it well.

E. R. Shenk is president of Erie Sand & Gravel Company. J. S. St. John is vice-president and general manager, and is in active charge of operations. R. C. McClenethan is secretary and treasurer; A. J. Schaffner is purchasing agent; and Albert Guianen is superintendent.

Flood Control Project

City and County authorities use Federal Funds for river rectification project on north side of Milwaukee

By PAUL ZIEMKE

ADVANCING real estate development, steadily forging into the farm lands north of Milwaukee, made the flood menace increasingly serious for property owners near this section of the Milwaukee River. A limestone and dolomite ledge, resisting the wearing effect of the river, developed an elevation which prevented prompt run-off of the semi-annual floods. This ledge extended from a point south and east of the Port Washington Road Bridge approximately 2,000 feet into Estabrook Park, one of the largest in Milwaukee County's famous system of parks.

Records dating back to 1915 show that considerable flooding occurred each year in this section. Lowest yearly discharge was in 1931, and was 830 second feet. Maximum discharge came in 1924, and was 14,700 second feet.

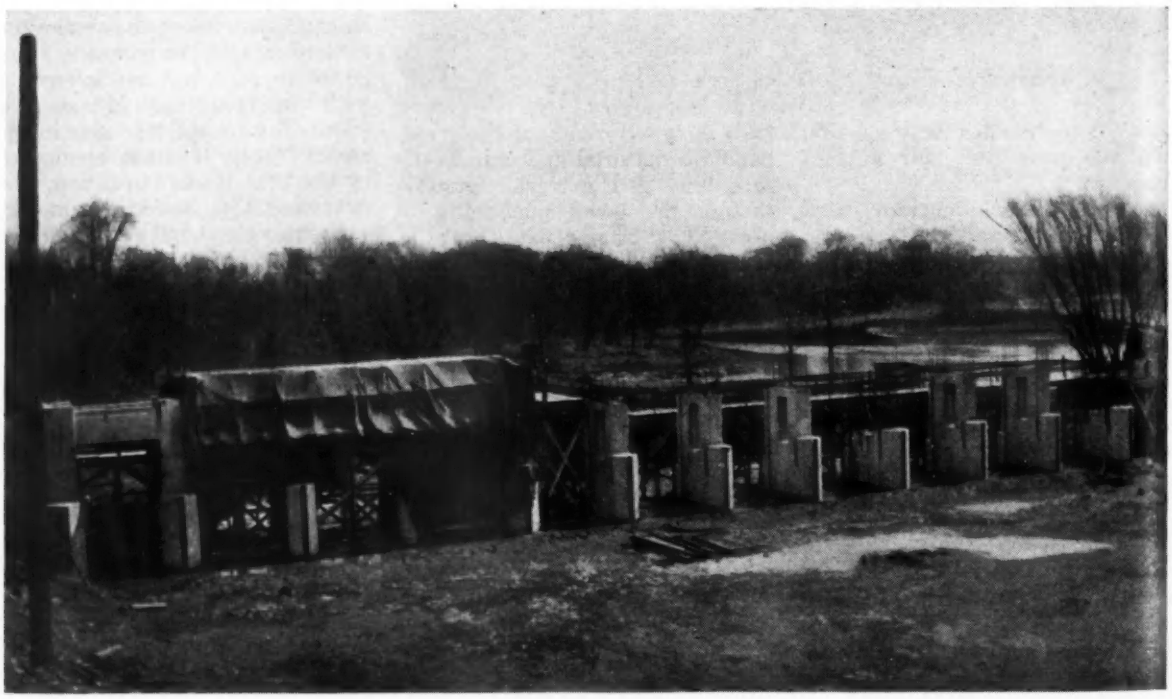
Agitation by property owners crystallized in a determination to seek relief through federal flood control programs. Local responsibility was divided between City and County, as property owned by both was in question. The City Bureau of Engineers and the County Planning Department investigated, and set up plans for the necessary work. A grade line ascending .0002 feet per foot northwestward was established. It was decided that a 200-foot-wide channel would be necessary. The average rock cut would be eight feet, which involved removal from County and City sections of river bed of about 225,000 cubic yards.

Work Gets Under Way

With Congress providing funds, work was begun in December, 1933. The job was really divided into two projects, one being under supervision of the City; and the other, the County. On the west side of the Port Washington Bridge a 2,500-foot dike was constructed of clay, and rip-rapped with stone from the river bed. A dike of almost similar proportions was built by County workmen southeastward from the "Port" bridge. The dikes measured roughly 5½ feet across the top and 10 feet across the bottom, with a 2½ foot slope.

The area diked-in was drained December 19, 1933, and drilling commenced at once. Compressors of the truck-mounted type and drilling equipment were rented from the Van Vechten Construction Company and the Hirth Concrete Breaking Company.

Timken bits on hollow drill steel, driven by Ingersoll-Rand jackhammers and compressors soon made the winter air reverberate with the roar that is characteristic of large rock removal operations. The Van Vechten Company used 2¼ inch drill bits, enabling the use of 1¾ inch dynamite, while the Hirth Company used 1½ inch bits and the dynamite used was either 1¼ or 1⅛ inches in diameter. Both parties used 40% Hercules gelatine. Power for blasting not being readily available, portable generators of the push-down type were used. These served reasonably well, but the drillers were prevented from averaging a large



● This $65,000 flood control dam is being built in Estabrook Park by CCC forces as part of County and City project north of Milwaukee.

daily footage through unfamiliarity with the rock and because of severe temperatures.

Drill crews of eight men each averaged 130 holes, ranging in depth from 3 to 8 feet, for an eight hour shift. One-pound charges per hole were the average.

Second Shift Added

Additional Federal funds obtained through the Civil Works Administration permitted the employment of a second shift by both City and County, after a short time. Some 200 men were employed on each shift. For night work, 1000-watt flood-lights were mounted on standard light poles along the length of each project, some poles mounting two units and others one. Two additional units were mounted on portable towers, and provided efficient lighting for night drilling and blasting. With power available and larger blasts being prepared, power blasting equipment was installed. A 3KVA-220 volt, one to one ratio transformer was connected to the lighting mains on each project, to furnish a source of ungrounded blasting power. Alternate light poles had switch boxes enclosing a 45 amp. double pole, double-throw knife switch-mounted. The lids of the boxes were so arranged that a baffle in the inner side of the lid permitted closing only when the switch was in the "down" and "off" position.

Seven hundred feet of No. 12 stranded duplex rubber covered cable was attached to the switch blades. The lower switch clips were short-circuited and grounded, the short firing cable being thus thoroughly protected against stray electric currents from nearby circuits. Connection to the source of power was provided through the fuse block in the upper portion of the switch box and through a short jumper of cable. The purpose of the jumper was to add an additional safeguard to prevent a premature explosion, due to some unauthorized person getting access to the switch box lock.

Plenty of Blasting Problems

Blasting was not carried on without a series of obstacles,

● **Left: Rock excavated from the river bed is crushed and used for highway aggregates. This is the No. 3 Austin crusher operated by the City. Right: No danger of anyone mistaking the contents of this house. Note the safe-like door to keep unauthorized persons out.**

however. The drill cuttings of limestone thoroughly impregnated the water in the drill holes and crevices, so that the water provided a shunt or path of short circuit to the blasting current. Another condition that soon came to light was the presence of a heavy seam of iron pyrites underlying the limestone. This added to the conductivity of the rock and served as a contributing factor in the varied troubles experienced in keeping the maze of blasting connections insulated. Tests made to determine the cause of the trouble experienced, developed a theory of leakage of current from the shot firing circuit that corresponds with the data published by the United States Bureau of Mines in Technical Paper No. 471.

Misfires were eliminated after study by the use of the best water-proof caps, new connecting wire of good insulation, and the thorough sealing of the multitude of connections necessary in connecting up several hundred blast holes. Much of the area blasted was under water, so the job of tapping joints was a laborious one, consuming hours of time for several men crawling about in hip boots. A recent development is the use of hot tar insulating compound in which each wire joint is dipped. This process gives a water-proof and insulating joint in one-tenth the time previously consumed by tapping.

Another precaution taken was the final connecting of the various series circuits to parallel circuits in even series. Experience has proven that uniform results are obtained only when the circuit is evenly balanced, insuring an even distribution of the blasting current employed. The series-in-parallel circuit was used because of the hazard of laborers breaking open a circuit under foot when laying the protective matting of steel woven fencing. In case of breakage, a close check with a galvanometer can give the blaster warning which series is opened, if the series-in-parallel method is used.

Blasted rock was loaded to trucks by shovels and transported to crushing plants where it was made into aggregates for concrete and other road-surfacing material. The City operated a No. 3 Austin crusher powered by a

(Continued on page 532)

Compressor Lubrication

Continuing Excavating Engineer's series on the "how" and "why" of correct lubrication for excavating equipment.

By C. J. COPLEY

COMPRESSED air is the pivot upon which depends either the success or failure of countless devices. The victim of infantile paralysis, depending for continued life upon the respiratory assistance given him by the mechanical lung knows little, and cares less, about the mechanics of the compression of air that keeps him alive. Miners, working underground at great depths, are only able to continue their work by grace of huge compressors, faithfully maintaining a never-ending supply of fresh air at the lowest mine-levels. The submarine, one of the effective arms of naval defense, can only spring its concealed attack by drawing on its supply of compressed air.

The construction field, is perhaps where compressed air comes into its own. From the driving of a skyscraper rivet to the tamping of a railroad tie, compressed air is considered a necessity in getting a job done with both speed and efficiency. The operator of an air-driven pavement "buster" delivers more effective blows in five minutes than he could with a pick in an hour. Labor time and job costs are computed on the basis of continued air tool operation.

Compressed air is considered a necessary tool of production. Yet, like the tail on the dog, the maintenance of the compressor itself, the vital source of energy supplying the life to these many tools, is lost sight of in the casual acceptance of its efficient accomplishments.

We say "efficient accomplishments" advisedly. The compressor has been designed to produce efficient power, and will continue to deliver its rated cubic feet of air per minute if it is given a chance to do so and not handicapped by the old efficiency stealer—"neglected maintenance." Loss of tool power, sluggish tool operation and the dangers of compressor explosion can often be traced back to improper compressor maintenance. In any sort of mechanical maintenance, lubrication plays the star role and like all stars can, at times, be considerably temperamental.

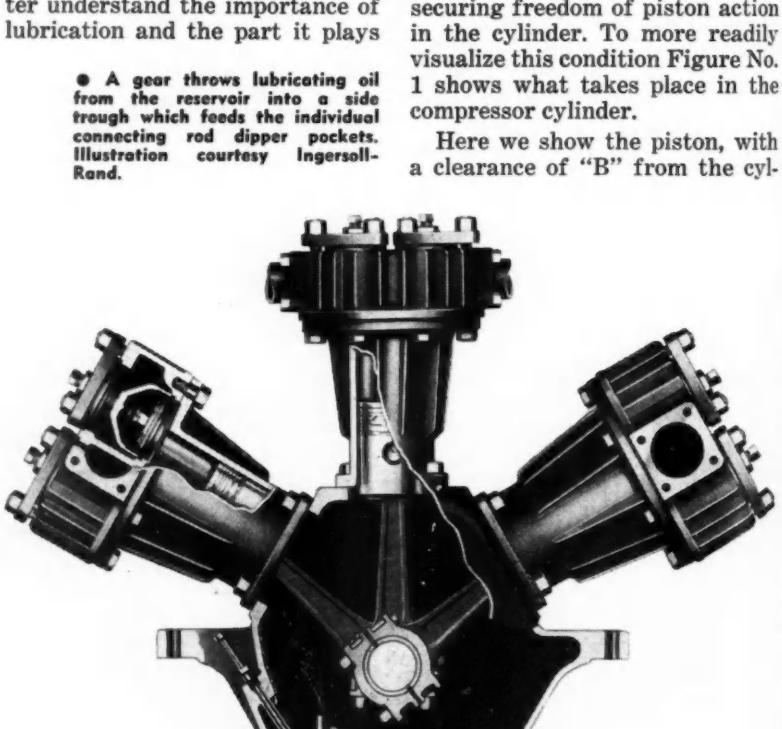
The lubricant for the air compressor will pay dividends many times over, if it is selected with an understanding of the duties it is expected to perform. Stock instructions of "Use a good engine oil" and "Use an S.A.E. 'so and so' oil" are not sufficient guides to the conscientious compressor operator to enable him to purchase or use the right oil. To better understand the importance of lubrication and the part it plays in compressor maintenance, let us take a quick look at the duties the lubricant is called upon to perform.

The lubricant acts in two capacities, both of equal importance. It acts as a lubricant to prevent wear of piston rings and bearings, and it further performs as a seal between piston ring and cylinder wall to increase compression efficiency.

Piston Ring Wear

The efficiency of a compressor necessarily depends on the ability of the piston to compress the air in the cylinder. It is appreciated that the piston must move freely in the cylinder, therefore demanding a certain clearance allowance between piston and cylinder wall. As the piston moves upward on the compression stroke the air seeks to escape through this clearance space between the piston and cylinder wall. The greater the compression ratio the harder the air tries to escape. To reduce this loss of air, or loss of compression, piston rings are used to fill in this clearance left by the necessity of securing freedom of piston action in the cylinder. To more readily visualize this condition Figure No. 1 shows what takes place in the compressor cylinder.

Here we show the piston, with a clearance of "B" from the cyl-



● A gear throws lubricating oil from the reservoir into a side trough which feeds the individual connecting rod dipper pockets. Illustration courtesy Ingersoll-Rand.

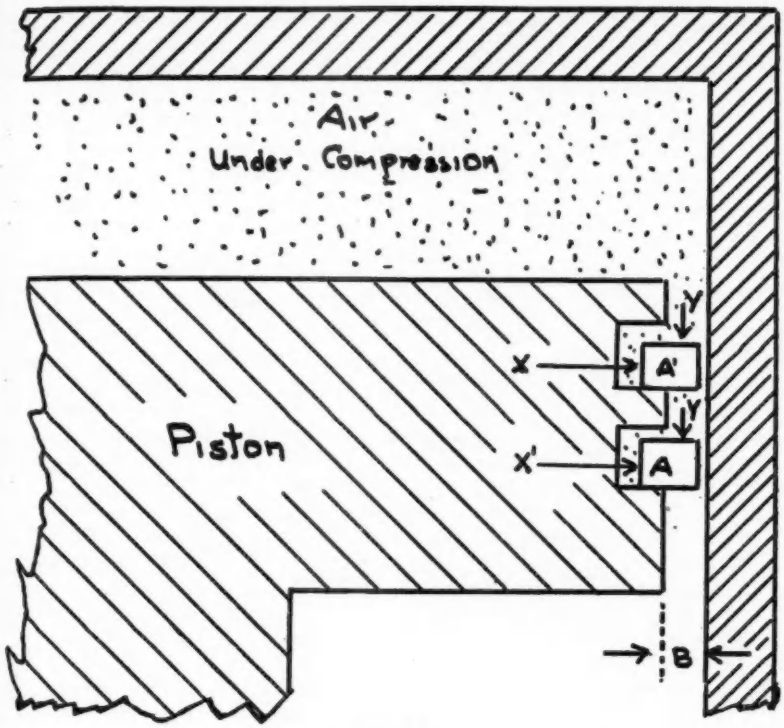


Figure 1

inder wall, equipped with two piston rings "A" and "A¹," moving upward to compress the air in the top of the cylinder. As the pressure of the air is built up in the head of the cylinder, it can be appreciated that the air, in its attempt to escape, pushes downward on top of the piston rings as at "Y" and "Y¹" and also tends to push the rings out against the the cylinder wall as shown at "X" and "X¹." This force, increasing as the compression increases tends to set up a metal to metal contact between the bottom of the piston ring and piston, as well as between the piston ring and cylinder wall. To reduce this metal to metal friction, a lubricant is supplied and called upon to establish an oil-film upon which the ring may slide with minimum friction loss.

It can be seen we need an oil that will maintain its body under pressure and, at the same time, will not thin out when subjected to high temperatures caused by the compression of the air. It must be heavy enough to maintain this protective film and yet thin enough that it will readily spread and cover the entire cylinder wall to establish a complete film. It also must not be of such heavy body to set-up an oil drag on the piston, thereby increasing power consumption. Since the film on the cylinder wall is exposed to the high temperature of compression while in contact with the compressed oxygen of the air, it must resist any chemical change, a change that might result in the formation of carbon. This carbon formation is undesirable, as it may stick the piston rings and permit the leakage of air from the cylinder. The use of an incorrect oil in the presence of dirty air may cause the formation of carbonaceous deposits on the discharge valves, which will interfere with their operation to such an extent that they will fail to close completely or quickly enough, permitting the leakage of air back into the cylinder. This type of leakage is called re-compression and results in the development of excessive heat.

Formation of Seal

We have explained the function of the piston ring, and the part it plays in increasing compressive efficiency. Should we examine under the microscope the sliding surface of the ring, as well as the surface of the cylinder on which it rubs, we note—no matter how well machined and honed these surfaces are—they represent surfaces made up of metallic hills and valleys. While they appear to be a tight fit to the eye, they nevertheless are not air-tight. Consequently, the lubricating oil, by filling in between these hills and valleys, acts as an efficient seal to take up the small clearances left by mechanical inefficiencies of metal finishing.

Should the oil be too light in body, the film formed may be blown out by the high pressure of the air trapped in the cylinder, thus reducing the efficiency of compression. Should the oil be too heavy to be readily distributed so that complete coverage of the cylinder wall is not secured, we may experience "blow by" caused by inadequate film formation.

A high quality, well refined oil is an important quality to demand in our compressor lubricant, both for efficient piston ring lubrication as well as for efficient formation of seals.

Bearing Wear

The lubrication of bearings, whether the application of the lubricant be by bath, splash or ring oiled, is based on what is known as the Oil Wedge Theory. This theory has been proven to be of practical value, and its conception is for any oil lubricated bearing. For the sake of clarity, let us show in Figure No. 2 a shaft "A" in a plain housing "B." The space between the bearing and shaft is filled with the lubricant. We note the shaft rests on the

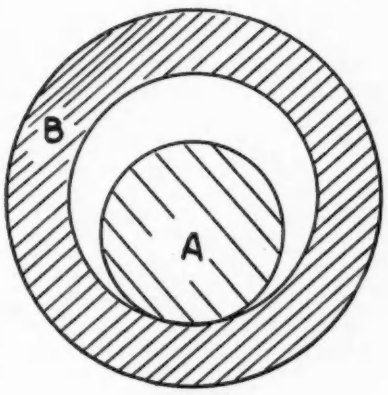


Figure 2

housing. As the shaft starts to rotate, some of the oil adheres to the shaft "A" and is pulled between the shaft and housing; until, when a certain speed is reached, the shaft now is floated on a full film of oil, as shown in Figure No. 3. Since the shaft is held completely away from the housing by the film of oil, metal to metal contact is impossible, and hence shaft or housing wear is impossible. As long as the film is maintained, the shaft is efficiently lubricated.

Should the oil be too heavy for this service, we set up an oil drag that tends to increase over all temperatures, resulting in a thinning out of the oil and reduction of the film thickness. This oil drag is technically known as fluid friction, and perhaps a little more explanation of this phenomenon may not be out of order. Consulting Figure No. 3 again, and noting the directional arrows in the oil-film, you will note that the oil next to the shaft is turning with it. By the same reasoning that some of the oil sticks to the surfaces it is in contact with, the oil next to the housing remains stationary. Showing this stationary effect by vector quantities, the direction of the oil flow at that point is opposite to that of the shaft. Consequently, some place in the oil-film, between the shaft and the housing, the oil is pulled apart or sheared. This shearing action is accomplished through the expenditure of work resulting in the giving off of heat. The heavier the oil, the more work is done to shear the film, and consequently, more heat is given off.

A practical example, with which we are all familiar, is trying to start an automobile on a cold winter morning when we neglected to change to a winter engine lubricant. We step on the starter and are rewarded with a few grunts and groans, but little rotating action of the crank-shaft. What has happened? Merely that there is not enough power in our starting battery to shear the heavy oil film, and at the same time, to turn the engine over.

This fluid friction, in our air compressor, may demand the consumption of more power than is necessary. A lighter bodied oil—

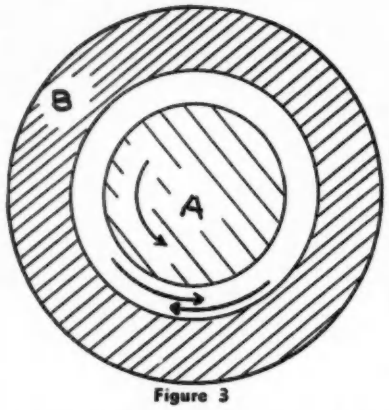


Figure 3

yet not too light to afford proper protecting films—should be used for maximum compressor efficiency.

The foregoing gives us a quick picture of the mechanics effecting the lubricant we are to employ for our compressor. Correct lubrication depends on three important considerations, viz. The Proper Oil, The Right Feed of the Right Oil (Cylinders with Mechanical Forced Feed Lubrication) and Assurance of Clean Intake Air.

The Proper Oil*

In discussing the lubricant for our compressor, we have cautioned against the use of too heavy an oil and too light an oil. While oil-body is of major importance, the **PROPER** oil involves one or two other points of consideration. It is not our purpose to become involved in refining methods or procedure or discussions of relative values of compressor lubricants made from different assortments of crude bases. We do know that lubricants having the characteristics of maintaining their body under increasing temperatures are important. In general, lubricants made from Paraffin crudes enjoy this characteristic, providing they have been carefully made at the refinery. A poor tailor may start with the best of fabrics and yet will turn out a poor suit of clothes. Consequently, be sure to demand the highest quality in purchasing your compressor oil. Then too, there has been a general tendency with portable compressors, to use the same oil selected for the gasoline engine. This is unquestionably a dangerous practice—dangerous in terms of handicapping compressor out-put and continued compressor operation. During the past year or two, manufacturers of engine oils have been more or less forced to make certain additives to their products to meet certain gasoline and diesel engine conditions. These additives are objectionable, from the viewpoint of compressor lubrication, in that most of them detract from the stability of the oil in bringing out other desired characteristics. Since our compressor lubricant comes into contact with air under pressure at high temperatures—a condition conducive to carbonization—our oil should be of the highest stability in order to overcome these conditions. Therefore, let us be emphatic in insisting on the use of straight mineral oils only and the total absence of any additive detracting from oil stability.

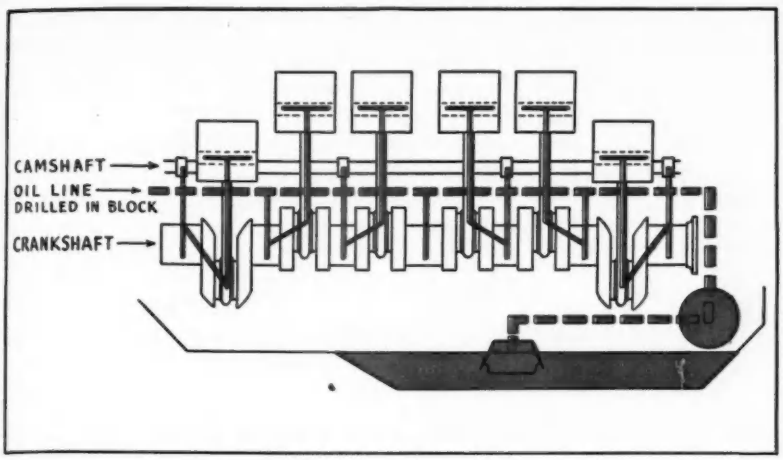
Reviewing then, the proper oil for our compressor should be a highly refined Paraffinic lubricant containing no additives or compounds detrimentally affecting stability of proper body. The proper body for air-cooled compressors should have a maximum viscosity of 600 Saybolt seconds at 100°F. and a minimum viscosity of 65 Saybolt seconds at 210°F. The proper body for water-cooled compressors should be a maximum of 320 Saybolt seconds at 100°F. and 50 Saybolt seconds at minimum at 210°F. The practice of using engine oils should be avoided except on the assurance of your oil supplier that it is suitable for compressor service.

Minimum Feeds

The question of proper feeds to the air cylinder is of real importance. It must be remembered that the oil fed into the cylinder is neither burned nor lost by evaporation and, with these two sources of loss absent, only a small

* **The discussion of paraffin base lubricating oils as compared to naphthene or mixed base oils, is subject to debate, according to compressor manufacturers.**

Paraffin base oils, as a class, usually have a higher flash point and viscosity index and frequently show lower oil consumption. On the other hand, naphthene base oils, show lower carbon residue. Furthermore, carbon deposits from oils of this type are comparatively soft and easily removed, and are less objectionable than the hard, tenacious deposits which can occur with paraffin base oils.



● This illustration shows force-feed principal which distributes oil to all moving parts through drilled oil lines in block of compressor unit. Oil flow is actuated by a gear-driven pump. Illustration courtesy Schramm, Inc.

quantity of the correct oil is required to maintain an efficient oil-film on the rubbing surfaces. Again, as there is little or no moisture to contend with in moderate-pressure air compressors, and as moderate cylinder wall temperatures exist, the oil-film can be maintained with a very small supply of the correct oil. Only enough oil to prevent wear and form the necessary piston seal is needed.

The tendency is always to over-lubricate. With the correct oil in service, a rate of oil feed that is very low, has never been known to produce operating troubles. High rates of feed contribute to the majority of air compressor lubricating troubles. The exact rate of feed is hard to be determined. Only examination of intake and discharge valves will show this.

On portable compressors, where cylnder lubrication is from crankcase splash, and hence beyond our control, be sure not to over-fill crank-cases, keeping the oil level well to the instructed or marked height.

Clean Intake Air

Objectionable carbonaceous deposits in the air compressor cylinder come from a combination of two sources, namely—from the oxidation of inferior air compressor lubricants and from impurities taken into the cylinder with the air to be compressed. These deposits collect chiefly on pistons, on discharge valves, and in discharge piping. They interfere with proper function of discharge valves and piston rings: they increase discharge temperatures and reduce the compression efficiency of the compressor. They may even cause breakage of rings or valves. Accumulating in receivers and discharge lines, they give off vapors that may, if ignited, produce a serious explosion.

The cause of deposits is due primarily to the use of inferior, unstable, cheaply refined lubricating oil. They may also be caused by over-feeding, necessary with oils that have little film strength. The most common cause is from impurities in the intake air. These air impurities collect where there is excess oil due to overfeeding. Eventually, this combination of dust, soot, cinders, gases from chimney and factory stacks, etc., bakes into deposits which are sometimes confused with the carbonized deposits of inferior lubricating oils. The use of heavy oils aggravates this condition. Air apparently clean, has been proven to contain over 100,000 dust particles per cubic inch. Much of this dust is carbonaceous and when deposited in cylinders and coated with oil, is very easily mistaken for carbonized lubricating oil.

It is essential, then, that the intake air be passed through properly maintained filters—and the intake itself be located in clean surroundings where the possibilities of air contamination are reduced to a minimum.

Explosions

Some operators are overly cautious in selecting the lubricant for their compressor, and perhaps their caution is well founded on experience with compressor explosions. They lay great stress on specifying that the oil they want must have a very high "flash point" and will select one over another because of a difference of 20 to 25 degrees in their relative Flash Points. Before going any further with this discussion, let us make one definite statement—the Flash Point of a proper compressor lubricant has nothing to do with the dangers of explosions. The Flash Point of **any** compressor oil has bee nexceeded by several hundred degrees to reach sufficient heat to cause explosions. However, explosions do occur and usually can be traced to the lack of certain precautions.

Explosions may be of two types—those that are sudden and violent and result from the combustion of an explosive mixture which causes rupture of some part of the apparatus; and explosions caused by a weakening or failure of some part. Explosions are generally confined to discharge lines and receivers.

The investigation of air compressor explosions generally reveals the presence of undue oil deposits resulting from excess oil feed. "Carbon deposits," in quantity, are usually present on the discharge valves and in the discharge passages, pipe lines and receivers.

An explosion may be the result of the accumulation of oil or a dust mixture. Where an inflammable product such as Kerosene has been used for cleaning the compressor, explosions are very apt to occur. Kerosene, or a similar product, should, therefore, never be used for cleaning internal parts of air compressors.

When the temperature of the compressor becomes abnormally high, as when the cooling water fails, an explosive mixture may be formed by the vaporization of the oil. Any oil will vaporize slightly at high temperatures, but an incorrect oil will aggravate the trouble. This condition cannot come about if the operation of a compressor is watched. Abnormal conditions resulting from any

cause should be promptly corrected. The use of a high quality oil, and periodic cleaning of the valves, pipe lines and receivers will do much to prevent explosions.

It is sometimes difficult to determine the cause of an unusual rise in temperature. However, when cleanliness is neglected and excessive deposits form in the discharge valve passages and on the valves, the flow of heated compressed air is restricted so that "wire drawing" of air may result. This "wire drawing" of air results in the development of excessive temperatures. If carbonaceous deposits cause the discharge valves to stick, the heated compressed air may be drawn back into the cylinder and re-compressed, resulting in a building up of temperatures to a very high degree. These are common causes of overheating—causes of excessive temperatures that may result in explosions.

Most of these troubles can be traced to the use of an inferior lubricating oil, or an unsuitable oil, or to even the over-feeding of a correct oil. Freedom from these troubles is best assured by the sparing use of an oil of the right body and characteristics to meet the demands of air compressor work.

Rules for Compressor Operation

A close adherence to the following rules for operating air compressors will guard against the most common troubles, often charged directly or indirectly to lubrication.

A. Location of intake air line.

The end of the suction pipe should if possible be so located as to take cool, clean air. Where impurities are present the air should be screened or filtered.

B. Cooling.

Cooling water for cylinder jackets and heads should always be turned on before the air compressor is started. Temperature readings should be made of the cooling water at inlet and outlet to detect irregular flow of cooling water.

Discharge air temperatures should be regularly reported, as any rise in temperature is an indication of irregularity of operation, i.e., deficient cooling, leaking of valves or poor piston seal.

C. Draining.

Drain cocks should be placed at low points in the discharge air line, and receivers for drawing off the accumulated oil, water and impurities. Draining should be frequent enough to insure cleanliness of the system.

D. Pressure Gauges.

Reliable pressure gauges should be installed on receivers and should be checked with standard gauges.

E. Cleaning.

The best of lubricating oils will deposit some carbon. The compressor system should be inspected periodically and cleaned when the inspection reveals appreciable deposits. Mechanical removal of the deposits is recommended.

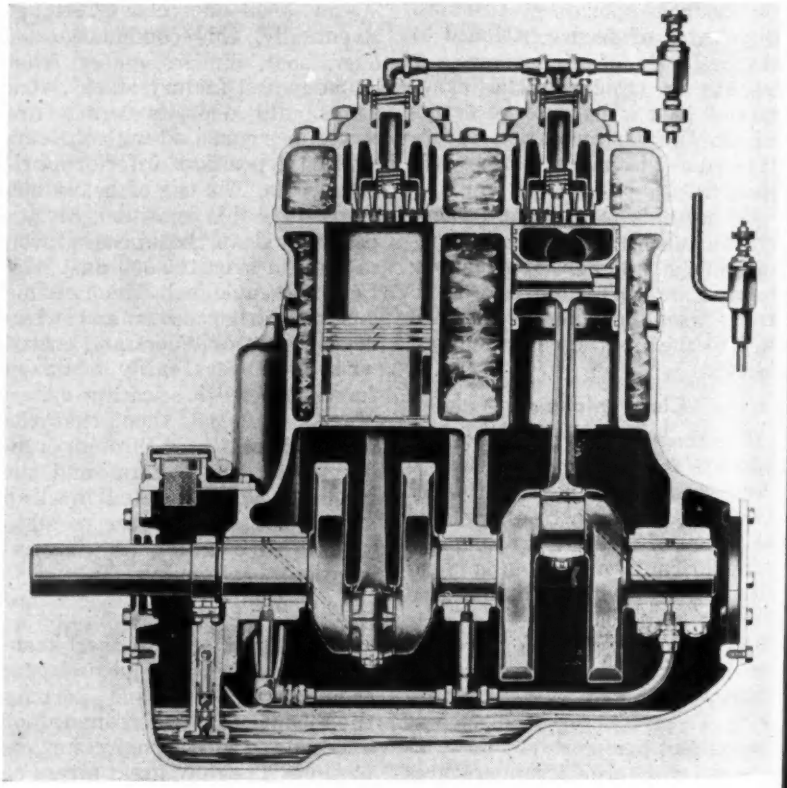
The use of soap or mild alkali solution will not dissolve carbon deposits, but is sometimes effective for removing oily or gummy deposits. Great care must be exercised when these solutions are used and the compressor should always **run unloaded.** All parts should be thoroughly oiled after such treatment.

NEVER use kerosene, gasoline or other highly volatile petroleum products in an air cylinder for any purpose whatever, because of their volatile nature under heated conditions.

F. Lubricating oil.

Use only a high quality, specially refined compressor oil. Use only the smallest feed of this oil that will furnish lubrication and seal. Where lubrication is from the crank-case, keep the level at the indicated height. DO NOT use Motor Oils except on engineering advice.

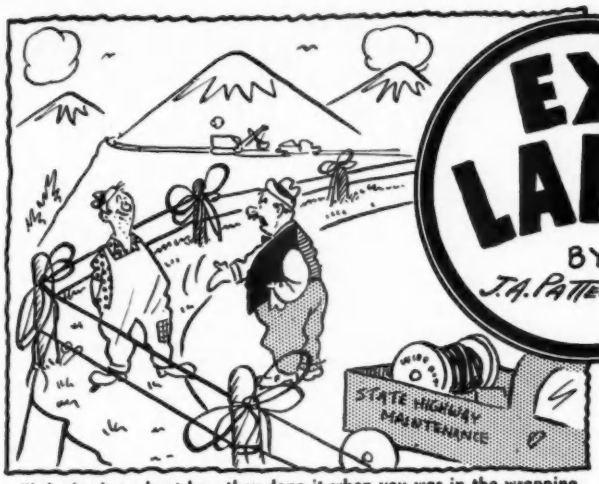
In the foregoing paragraphs, we have tried to show why lubricants are needed in compressor operation—the job the lubricant is called upon to perform—and some of the hazards involved in the use of inferior or improper lubricants. Owners and operators of air compressors should expect maximum out-put, economical operation and dependable service.



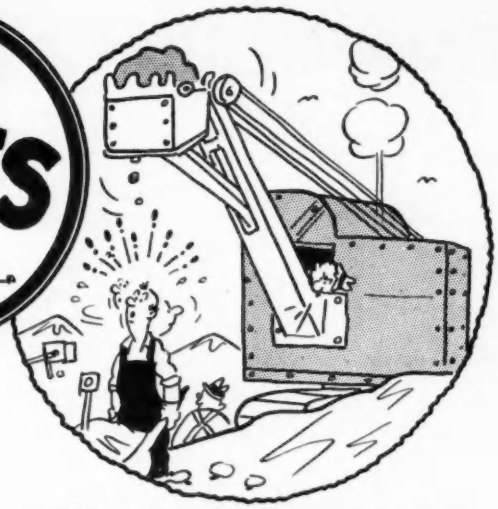
● Oil is supplied to main and crank pin bearings on this duplex compressor by a plunger pump which is driven by an eccentric on the end of the crankshaft. Pistons, piston pins and cylinder walls are lubricated by the oil spray from the crank pin bearings. Illustration courtesy Gardner-Denver.

EX-LAFFS

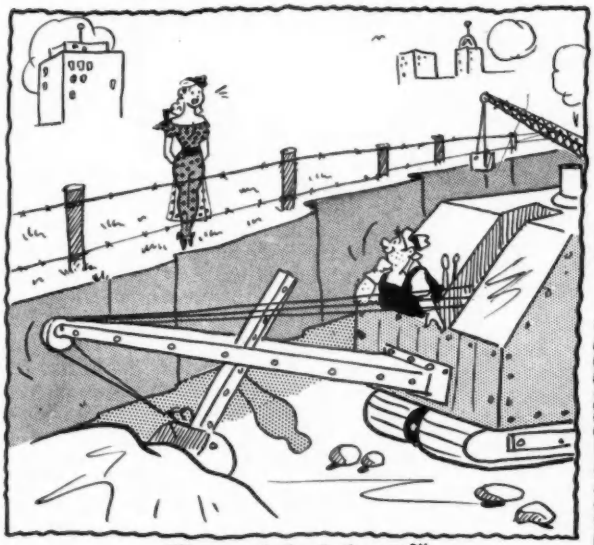
BY J.A. PATTERSON



"I don't give a hoot how they done it when you was in the wrapping department, at Dacey's Department Store!"



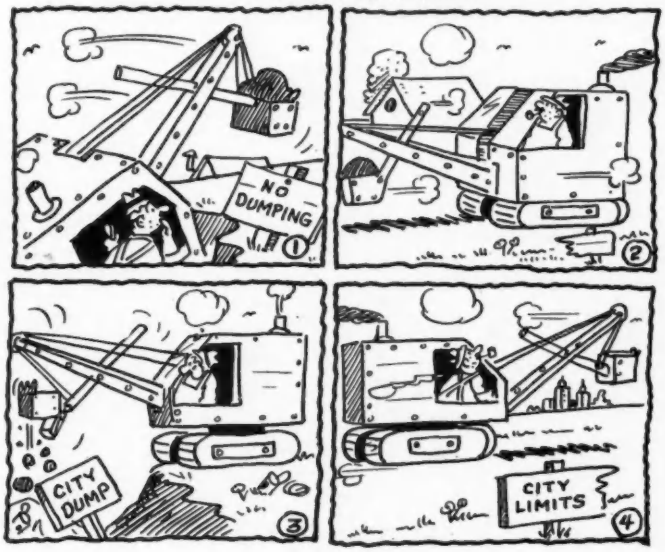
"Oh say, Harrison, didn't I see you out with my wife last night?"



"Does my shadow bother you?"

"After all, Mr. Mosely — do you think all this is necessary to sell excavating equipment?"

"I seem to be amusing the crowd, today, don't I?"



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August Construction Total Largest Since July 1937

The largest volume of construction contracts since July 1937 was awarded in the 37 Eastern States during August, according to F. W. Dodge Corporation. The month's total of $313,141,000 represented increases of 12 per cent over August of last year and 30 per cent over July of this year. Both privately financed and publicly financed projects increased over the preceding month, and the August construction total of nine out of fifteen districts ran ahead of the corresponding district totals of August 1937.

In all fifteen districts, August residential contracts ran ahead of August 1937, and produced the largest national residential total since April 1937. Residential awards for the month amounted to $99,632,000, being a 36 per cent increase over August of last year and a 13 per cent increase over July of this year. Since the volume of small-house construction began to increase over last year as early as last May, and since total residential building was 7 per cent over last year in July, the August record was a continuation and confirmation of a definite upward trend.

The new Federal public works program made itself felt in the August total for public works and utilities, amounting to $125,093,000, which was 40 per cent ahead of the August 1937 figure and 60 per cent ahead of the July 1938 figure. Non-residential building, with an August total of $87,316,000, ran 20 per cent ahead of the preceding month, although it lagged 26 per cent behind the total for August 1937.

You Can Get Copies of "When Business Grows"

The editorial on the following page is the third in a series adapted to the excavating field from business bulletins distributed by the S. D. Warren Company to its employees. You can get attractive reprints of "When A Business Grows" to distribute to your employees if you so desire. Simply send us one cent each (minimum order is ten reprints) for each copy of the reprint you want.

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Other articles (a total of twelve will be published) include, "Who Owns Business," "Are Business Men Smart," and "Who Sets Prices." If you want reprints of the entire series of 12, we will gladly reserve them for you, and send them along as published. Just address your requests to Excavating Engineer, South Milwaukee, Wisconsin. Tell us the number of reprints of each article you want, and enclose check or money order to cover the total at one cent each. We will send you promptly reprints of the articles already printed and the others will follow as they are published.

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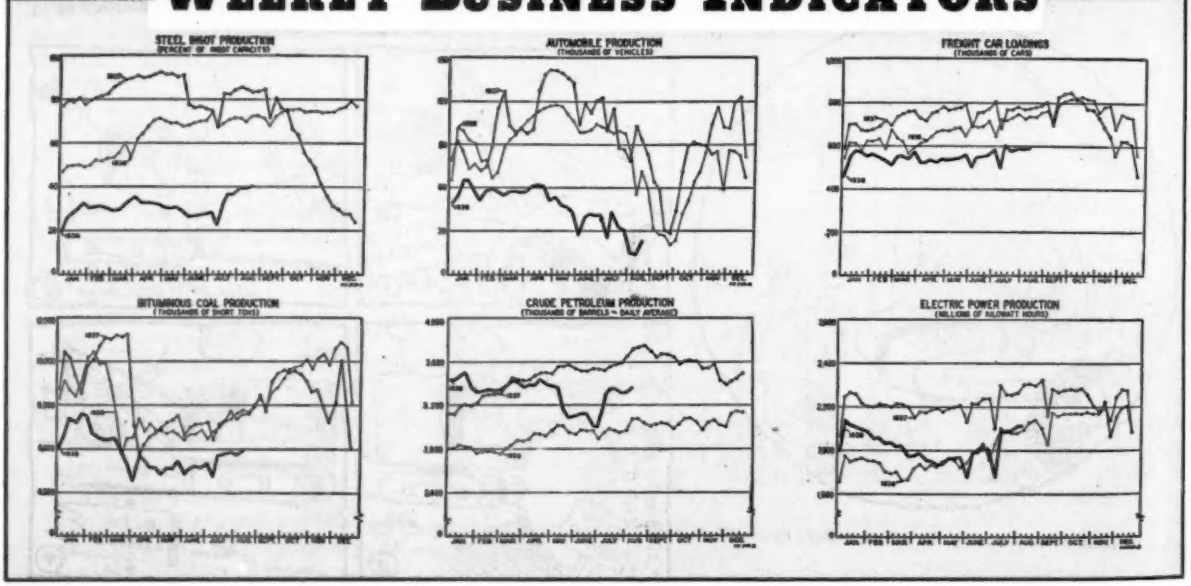
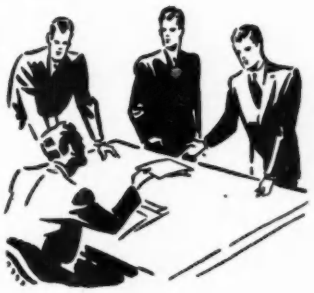
This offer is made because Excavating Engineer believes this series of articles explains the American business system so simply and clearly that you might like to tell the story of our system to your employees in this way.

WEEKLY BUSINESS INDICATORS



When A Business Grows

IF A TRUCK-DRIVER who becomes a truck contractor does a good job running his business alone; if he is successful in selecting good assistants and planning work for them and teaching them; if he wins the trust and interest of his assistants by honesty and ability, he may be able to build his business until it is so big that he can't look after all of it himself. If the business gets that big, the boss will have to create departments and assign men to head those departments and to manage certain parts of the business. One of the department heads will manage the job of finding customers, another will manage the job of keeping the trucks repaired and running, one will manage assigning trucks to different jobs, another may run the job of keeping accounts and collecting the bills.



In a large business the department executives often learn to do their own work better than the big boss could do it. The job of the big boss is to decide what should be done and to keep the department heads working together to do it. If the big boss is to do his job well, he must be able to respect his assistants and appreciate their abilities, and he must win their appreciation and respect.

The head of a business must be fair and honest to gain the respect of his department heads. The department heads must be fair and honest to gain the respect of the boss, the respect of other department heads and the respect and cooperation of their own men.

If the boss is unfair to customers, his department heads will find out about it and will realize that sooner or later he will be unfair to them. In that case, they will distrust him and will be unable to work with him whole-heartedly. When chances come to get other jobs, the department heads will leave, and the business will suffer from inefficiency caused by frequent changes and lack of confidence.

If one of the department heads is unfair with his assistants, the other department heads will take note of it and realize that he will be unfair with them if he gets the chance. So they will distrust him, and sooner or later he will lose their cooperation and his work will suffer. Sooner or later the boss will have to dismiss him.

At times the boss seems slow to learn that a man is wrong, but he is not usually as slow as he seems to be. A capable business man strives patiently to help his men correct their faults, and often he is successful, but if he discovers that a man lacks the character that is required in important positions in business, he must dismiss him. If he fails to do that, he will eventually wreck his business and lose the money that he has invested in it.

When a man conducts a business without assistants, he has to get along with only himself and his customers. When a business gets big and employs a lot of people, it is necessary that they get along with each other so that they can work together. It is, of course, difficult for all of the people in a large group to like all of the other people in the group equally well, but it is necessary that all of the people in a business like each other well enough to work together without trouble.

However, the executives of a business must like each other very well in order to operate the business efficiently. Men who direct the different departments in a business do not always have the same opinions about policies and methods. At times they will find it necessary to disagree with each other and to argue the merits of their opinions until they can agree on a plan that seems likely to be beneficial to the business. In order to conduct such arguments sensibly, intelligently and without anger, it is absolutely necessary that the executives of a business like each other. And the liking must be based on mutual respect and integrity.

If a man is unfair and not entirely honest, he is not respected or trusted by his associates. If he argues to support his opinion, his associates will suspect that he has a selfish or unfair purpose, and they will discount his opinion or ignore it. Such a man cannot occupy a permanent position, or he would destroy efficiency and eventually ruin the business.

A business must be operated efficiently if it is to continue to exist and to provide jobs. Efficient operation is possible only when the executives of the business are reasonably intelligent and thoroughly co-operative so that they can exchange information freely and with complete confidence. Co-operation and confidence are secured only when every executive of a business places complete trust in the integrity of his associates.

Now and then we observe a business that seems to get along without co-operation and without integrity and we wonder how. But sooner or later we learn that the business is gone or is under new management.

Every once in a while we hear of the success of some fellow whom we know to be lacking in character and we wonder how he does it. But eventually the goblins get him.

Such observations emphasize the fact that the men who remain permanently in important positions in American business must be, and are, men of high character, who can win and hold the trust of other executives in the same businesses, and who are respected and trusted by executives of other businesses.

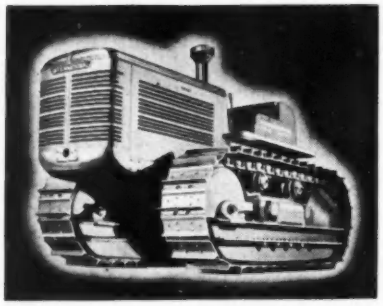
There is no other way in which business or the men who guide it can succeed.

Equipment you ought to KNOW ABOUT

New Model TracTracTor

A new, streamlined TracTracTor, model TD-65, has been announced by the International Harvester Company, Chicago, Illinois.

The TD-65 is operated by a 6-cylinder engine and has a maximum of 70 drawbar horsepower—these combine with a 6-speed transmission to give the operator correct power and speed for every job. Long track ground contact and approximately 21,000 pounds of weight provide traction to match the power of the engine and the requirements of heavy-



duty operation. All controls and gauges are within easy reach of the operator, who rides in a comfortable seat and has good vision to the front, sides, and rear.

The new model is the result of four years of experimentation and work, during which time experimental TD-65's have been spotted on strategic jobs and have submitted to numerous tests and various types of field work. It is expected that a few of the models will be completed this fall, although quantity production will not be reached by the factory until about the end of the year.

Yardage Tally

Counting the yardage hauled away, when the haulage fleet comprises trucks of various body sizes, is greatly simplified by a tally device being distributed to interested contractors by George Haiss Manufacturing Co., 141st Street and Canal Place, New York. It adds the cumulative yardage total by a simple movement of a dial indicator, and gives the user a useful check on his clamshell crane's work.

This device is available free to contractors who write for it on their business letterheads.

Blasting Agent

A new grade of "Nitramon" blasting agent to be called "Nitramon" No. 2 has just been announced by E. I. du Pont de Nemours & Company, Wilmington, Delaware. The new grade has all the safety advantages of the regular "Nitramon" and is to be used in the same way as the regular grade. Slower than the regular grade, it is sufficiently sensitive for quarry blasting, and is adapted to soft limestone and as a top load in harder material. Its density is great enough that it will sink in water holes and has a strength equivalent to 40% ammonia dynamite. Velocity is 10,000 feet per second.

New Steel Tape

A new Wyteface steel tape one third lower in price than previous models and designed for general use is the latest offering of Keuffel & Esser Co., Hoboken, New Jersey. The new tape has black graduations on a crack proof

white surface, easy to read, even in poor light. "Favorite Wyteface" is the name of this new tape which is enclosed in a leatherite case. Favorite Wyteface, made in 25, 50, 75 and 100 ft. lengths, will be sold by hardware and building supply dealers.

43 Cubic-Yard Truck

This 43-cubic yard truck, working on the Los Angeles flood con-

trol system, weighs 36 tons empty and its loaded weight is approximately 100 tons. This weight is supported by fourteen 13.50-24 Firestone Ground Grip Excavator tires in a tandem triple installation, and it is supported so well that the tires do not deflect nearly as much as the dried up Los Angeles River bed.

Compare these tires with the four 6.00-16 tires on automobiles to get an idea of the size of the truck. Also compare the gear shift, which has 9 forward speeds and 3 reverse. The juggernaut goes 15 miles per hour loaded and 25 miles per hour when empty.

Power Brake

Where to get brakes powerful enough to stop two old AC Mack dump trucks recently re-powered with four cylinder Cummins Diesel Engines was a real problem for the New Riverside Ochre Company, Cartersville, Georgia.

Six days a week, the trucks carry from 400 to 1000 tons of Barytes a day. This rock, heavier and more valuable than any other, has a specific gravity of 4.3 and is used as a substitute for white lead. When the loaded trucks rolled down the winding hills, it was almost impossible to control them with ordinary brakes.

The chief mechanic devised a power brake by salvaging an oil hoist pump from an old dump truck and mounted it in the chassis to one side of the Diesel. The pump, driven by a fan belt, is attached to and capable of applying 300 pounds pressure to the master brake cylinder. As a safety

(Continued on page 521)

Equipment You Ought to Know About

(*Continued from page 518*)

measure because of the tremendous pressures that the pump can produce uncontrolled, a by-pass valve is set just below the point at which the brake rod will snap.

All Purpose Trailer

Announcement of a new six-wheel "All Purpose" trailer has been made by the C. R. Jahn Company of Chicago, pioneers in the exclusive manufacture of standard machinery trailers. This new trailer, which has been designed to transport numerous types of machinery, will handle loads up to 48,000 pounds. Among the more important features claimed for this six-wheel unit is the same ease of loading that has been available on Jahn "single purpose" trailers, as well as their four-wheel "all purpose" units.

The easier and faster loading method of Jahn trailers is made possible by means of the unique construction at the front end of the trailer frame, which serves as both a connection and turntable for the front axle, and permits the entire front axle assembly to be removed. Two rear axle arrangements are available on this new trailer—either tandem or dual oscillating types, and all wheels are equipped with heavy duty full balloon pneumatic tires. Standard equipment includes adequate loading ramps, lash rings riveted to side frames, heavy draw bar safety chains, reflectors, stake pockets and flag sockets.

Electric Etcher

An improved tool for marking positive, permanent identification is the Ideal Electric marker, manufactured by the Ideal Commutator Dresser Company, 4104 Park Avenue, Sycamore, Illinois.

The marker cuts owner's name, sizes, numbers, models and other information on steel, iron, bronze, glass, bakelite, ceramics, composition and other surfaces. Operated at a speed of 7200 cutting strokes a minute, it cuts into the surface of the material and leaves a clear, legible imprint which lasts a lifetime, providing the tool has ordinary use.

Arc-Weld Cleaner

A new compound, which is said to reduce cleaning time after welding by 20% to 60%, is announced by The Lincoln Electric Company, manufacturer of arc welding equipment and electrodes, Cleveland, Ohio.

This new compound, known as "Spatter Film," has been developed by Lincoln engineers to increase the economy of electric welding as a process of manufacture and fabrication. By reducing the tendency of spatter to adhere tightly, thus facilitating its removal, "Spatter Film" makes fabrication by arc welding still more economical. The savings resulting from use of the compound will be particularly apparent in work where painting and finishing are essential. "Spatter Film" is soluble in water. It is non-inflammable and contains no free alkali to injure the hands or harm paint.

Vulcanizer

Specially designed for 18.00-24 Heavy Duty "Super Traction"

All Perfectly BALANCED

Your experience has proved that flexibility is a vital characteristic of wire rope. But your experience has also proved that a rope which sacrifices other essential characteristics to gain flexibility will not stand up on the job.

Consequently, flexibility is one of the characteristics always to be found in "HERCULES" (Red Strand) Wire Rope—plus these other equally essential features — strength . . . elasticity . . . toughness . . . and durability. All perfectly balanced to assure better . . . longer . . . and more economical performance.

Your first trial will convince you that "HERCULES" (Red Strand) solves your wire rope problem the economical way. Try it on your next job.

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PREFORMED "HERCULES" (Red Strand) WIRE ROPE
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SEATTLE . . . 3410 First Ave., South

For your convenience in writing to A. Leschen & Sons, you will find a card bound in this issue.

truck tires, this new vulcanizing machine has been installed in the principal factory of The B. F. Goodrich Company in Akron, Ohio, to make possible repairs on this size casing. The vulcanizer was built by the James C. Heintz & Company, Cleveland, to Goodrich specifications.

Tires of this size are used extensively on the toughest kind of operations in road building, excavating, and general contracting. This size tire weighs 515 pounds, yet can safely carry 9 tons, or about 35 times its own weight. Operators using this size tire, when an injury occurs, require swiftest service on repairs and this new Goodrich equipment will provide just that.

Heavy-Duty Compressor

A new compressor delivering 425 cubic feet of air per minute at 100 pounds has been announced by Ingersoll-Rand. Known as the model 425, it is a self-contained compressor-plant, available in portable or semi-portable mountings. Employing the same slow-speed, heavy duty, stationery-type compressor usually purchased for a permanent installation, it is unique in the economy of its operation and the durability of its construction.

A four-cylinder, heavy-duty tractor-type engine drives the compressor through simple reduction gears. Either gasoline, gas or oil engines can be furnished. Copies of descriptive bulletin 2486 may be obtained from Ingersoll-Rand, 11 Broadway, New York City, or any of their branch offices.

Earth Drilling

A Buda-Hubron Earth drill was recently used on a job done for the Santa Fe Railroad by the Chicago contracting firm of Campbell, Lautermilch and Lowrie Company.

The job required sinking 120 holes 24" in diameter and 20' deep. The holes were for cast-in-place foundations. Inasmuch as the work was done on either side of a large sewer, it was necessary to build scaffolding over which to drive the truck. Another handicap was that at a depth of about 6 feet, sand was encountered. In order to overcome this obstacle, steel forms, slightly larger than the diameter of the holes, were driven down to the clay. The drill was then operated through these forms, and forms left in place

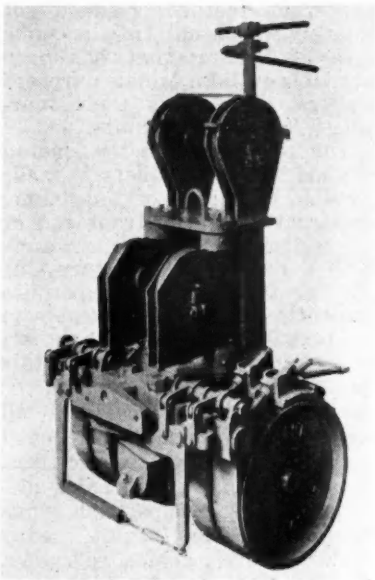
while concrete was poured. The entire job was completed in five days, working three shifts per day. In one 24 hour shift, 42 holes were drilled, and the fastest time on any hole was 12 minutes.

Standard machines drill holes to 24 feet in depth and from 13 to 30 inches in diameter. For lesser depths, drills to 42 inches in diameter are furnished. Special machines are built for drilling to depths of 24 to 50 feet.

Power Control Units

Emsco Model G-L-T Heavy Duty Power Control Units in single and double drum types of Standard, Long Drum, and Four Drum Models, recently have been announced by the Emsco Derrick & Equipment Company of Los Angeles, California, and Findlay, Ohio. According to the manufacturer, these units are the result of a comprehensive study of field conditions and contractor experience, which disclosed definitely that the industry is demanding a power control unit that can be depended on to give long and continuous operation without shutdowns, that will minimize cable wear, will not heat excessively under severe service nor require continuous adjustment, and that will reduce the clutch and brake relining to the minimum. It is claimed that these units not only meet these essential requirements, but also, because of 60 per cent less maintenance and the savings effected by a reduction of repair shutdown time, offer the operator the most economical power controlled unit now on the market.

Mounting of these units on any tractor is extremely simple and easy, as no cutting or drilling is required. The mounting uses fastening points provided by the tractor manufacturer and an automatically aligning internal-external gear type coupling connects the power takeoff shaft to the winch.



Air Line Respirator

Mine Safety Appliances Company of Pittsburgh, announces official approval by the U. S. Bureau of Mines of the M.S.A. Air Line Respirator and the M.S.A. Abrasive Mask. With the approval of these devices, respiratory protective equipment bearing this approval is available for use in many common industrial operations and processes which expose the worker to harmful dusts and fumes.

Full information on these products, and actual demonstrations if desired, will gladly be furnished by M.S.A. upon request. Address Mine Safety Appliances Company, Braddock, Thomas and Meade Sts., Pittsburgh, Pennsylvania.

. . . report owners of Austin-Western Portable Crushing Plants from coast to coast. Below are three typical reports which prove on-the-job efficiency and economy.

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"On the 20th day of April, 1937 we took delivery of Model 100 Austin-Western Crushing and Screening Plant. On June 15th we had completed crushing 75,000 tons of gravel 1¼" down with average crush of 35% of total. Our *average crush production* for above was *132 tons per hour.* The only replacement of parts was two sets of jaws. We had no bearing trouble of any description. Since then we have crushed 45,000 tons on three other projects without any trouble whatever. *We consider our Austin-Western Crushing Plant our best money-making piece of equipment."*

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"We have owned and operated No. 100 A-W Crushing and Screening Plant for four years and heartily recommend it. It will operate at a minimum upkeep cost and produce a maximum amount of finished aggregate without frequent shutdowns."

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"Now using our Austin-Western No. 100 for the third year. Very satisfactory handling both gravel and stone. Presently crushing stone to minus one inch, forty-five yards per hour."

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Self contained . . . readily transportable on its own pneumatic tires, the A-W portable can be operated from the pit or quarry nearest the job. This powerful, efficient unit delivers material in volume...at low cost for production and maintenance. Its operating economies combine with savings in haulage...and elimination of the fixed plant producer's profit...to assure you of crushed stone, sand and gravel at minimum cost.

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When writing to The Austin-Western Road Machinery Co., please use coupon or card bound in this issue.

Shots from the FIRING LINE

Shasta Dam Status

With construction starting early in September on Shasta Dam, the curtain has risen on one of the greatest of all reclamation dramas, John C. Page, United States Commissioner of Reclamation, reported recently to Secretary of the Interior Harold L. Ickes in summarizing the progress of work on the Central Valley Project.

Mr. Page returned to Washington, D. C., from a visit to the project in California. He said the $170,000,000 water conservation program in the Great Central Valley was advanced during the 1937-38 fiscal year from vision to reality.

A long series of preliminary investigations were virtually completed, field surveys were well extended on all three project divisions, plans were drawn and approved by the Bureau of Reclamation for many major structures, first actual building was begun, and negotiations were conducted to pave the way for heavy construction later this year and during 1939.

For the benefit of prospective workers, Mr. Page added that the time of large-scale employment has NOT arrived, and that the influx of unemployed persons to Shasta County and other parts of California's Great Central Valley has been far in excess of the number of workers needed for early construction. Mr. Page said the time of peak employment probably will not be reached for at least two years.

Almost every section of the nation is represented in the $35,939,450 general contract recently awarded to Pacific Constructors, Inc., for building Shasta Dam and power plant on the upper Sacramento River near Redding. Pacific Constructors is a combination of 12 large contracting firms located as follows:

East—The Arundel Corp., Baltimore, Md., and Foley Bros., Inc., New York City.

Middlewest—A. Guthrie & Co., St. Paul, Minn., and Hunkin-Conkey Construction Co., Cleveland, Ohio.

South—W. E. Callahan Co. and Gunther & Shirley Co., Dallas, Texas.

Rocky Mountains — Shofner, Gordon & Hinman, Denver, Colo., and Lawler & Maguire, Butte, Montana.

West Coast—Griffith Co., Metropolitan Construction Co., American Concrete and Steel Pipe Co., D. W. Thurston Co., and L. E. Dixon Co., all of Los Angeles.

In addition to Shasta Dam, smaller construction contracts have been awarded on the Central Valley Project in the sum of $1,495,434. These cover the erection of Bureau of Reclamation Construction camps near both the Shasta and Friant Dam sites, construction of the first 12 miles of the Contra Costa Canal, boring of a diversion tunnel through the west abutment of the Shasta Dam site, and building a warehouse and storage yard in the Sacramento River Canyon below the dam site.

Besides construction work, contracts for materials and supplies have been awarded in excess of $350,000, and contracts for dam site foundation exploration have been completed for $150,000.

More than 135 miles of main canal have been located. These include all of the 46-mile Contra Costa Canal, 68 miles of the 160-mile Friant-Kern Canal, and 22 miles of the 40-mile Madera Canal. In addition, approximately 300 miles of traverse have been surveyed on various proposed routes for the San Joaquin Pumping System.

● The appearance of this section near Redding, California, will soon be changed. It is the site of Shasta Dam, under contract to Pacific Constructors, Inc.

Contracts Awarded for 1st of 8 Bridges Required by Shasta Dam Construction

Award of contracts covering the construction of the Sacramento River bridge, first crossing, Southern Pacific Railroad relocation, Central Valley project, California, has been announced by Secretary of the Interior Ickes.

Clifford A. Dunn of Klamath Kalls, Oregon, was the successful bidder under schedule No. 1, with a bid of $173,320 for the construction of the abutments, pedestals, and piers for the bridge, and alterations to Riverside Drive under the south end of the bridge. Three hundred and thirty days are allowed for the completion of this work.

The American Bridge Company of

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"RPM" Diesel Engine Lubricating Oil is also available through distributors in more than 100 other countries.

Get in touch with your nearest distributor—for a clean engine, and long hard service with the minimum of overhaul.

WORLD-WIDE ACCEPTANCE

Pittsburgh, Pennsylvania, was awarded the contract under schedule No. 2 on its bid of $569,100 for furnishing material, labor, and equipment, and for fabricating, erecting and painting the bridge, except for certain construction work to be included in the Dunn contract. About 12,000,000 pounds of structural steel and other materials will be shipped from Gary, Indiana, to Redding, California, to be used in the construction of the bridge. Time allowed for completion of the contract is 430 days.

This is the first of eight bridges that will be required in connection with the relocation of 37 miles of the Southern Pacific Railroad around the Shasta Dam and is the first crossing of the Sacramento River.

Rapid Progress on Blue Ridge Parkway

So rapidly is the construction program for the 480-mile Blue Ridge Parkway progressing that a 140-mile unit in Virginia and North Carolina will probably be opened to traffic by next spring.

Fifty-five miles of the parkway road in Virginia have already been completed as to grading and drainage, and surfacing contracts are now under way. One unit of 8½ miles is between Rock Fish and Jarman's Gap, and the other is the 47 miles between Adney Gap and Pinnacles of Dan.

The 33-mile section between the Pinnacles of Dan and the North Carolina line will soon be totally under construction. A contract for grading and surfacing of 10 miles has already been awarded and the contract for another 13-mile section is about to be awarded. This 33-mile unit will connect the now graded 47-mile unit in Virginia between Adney Gap and the Pinnacles of Dan and the 59-mile unit of roadway already graded in North Carolina, furnishing a total of approximately 140 miles of continuous parkway road.

The 59 miles of graded parkway in North Carolina from the Virginia State line to the vicinity of Deep Gap are now under contract for surfacing. In addition, three sections between Beacon Heights and Gooch Gap, North Carolina, are under contract for grading. These three sections total approximately 31 miles.

In addition to the grading and surfacing now under contract, several overpasses and bridges are being constructed at intersections of important State highways.

During the fiscal year 1939, it is planned to construct five additional sections totaling 50 miles in Virginia between Roanoke and Rock Fish Gap. In North Carolina, it is planned to build four sections totaling approximately 38 miles, one section running from Deep Gap southwest to Blowing Rock, extending the now graded 59-mile unit from the State line. The second section will be routed southwest from Gooch Gap approximately 8 miles to Buck Creek Gap, connecting with sections now under construction.

The third and fourth sections will extend 14 miles from Wagon Road Gap to Tennessee Bald. This latter will be the first unit to be placed under construction west of Asheville.

Second 8-Mile Contra Costa Section Bids Opened

Bids for an additional eight miles of the Contra Costa Canal were opened September 30 in the Central Valley Project office in Sacramento. Walker R. Young, supervising engineer, said the first contract for excavation of the initial section—a four-mile earth ditch from Rock Slough to near Oakley—is now completed and work is under way on the next section comprising eight miles of the canal.

The bids just opened are for a concrete-lined section extending from a point 2 miles south of Antioch to a point 3½ miles west of Pittsburgh and will involve the excavation of about 650,000 cubic yards of earth and rock, and construction of four reinforced concrete siphons, seven highway bridges and other appurtenant structures. The successful bidder will be given 450 calendar days to complete the contract after receipt of the Government's official notice to proceed with the work.

This part of the canal will be approximately 23 feet wide at the water surface, 7 feet wide at the bottom, and will carry water about 6½ feet deep. The concrete lining will be three inches thick.

The initial capacity of the Contra Costa Canal is to be 350 cubic feet per second, successively diminishing along its 46-mile course in accordance with the amounts of water to be taken out at various delivery points. Mr. Young said that the canal capacity of the section now being advertised will diminish throughout its length from 291 to 256 cubic feet per second.

Roza Dam to Morrison-Knudsen

Morrison-Knudsen Company, Boise, Idaho, has been awarded contract for construction of the Roza Diversion Dam, one of the major engineering structures of the new Roza Division of the Yakima Federal Reclamation Project, on its bid of $526,860.

The dam will be a concrete structure about 55 feet high across the Yakima River about half way between Yakima and Ellensburg, Washington. It will divert water into the Yakima Ridge Canal, which will serve 72,000 acres of lands, now undeveloped, in the Roza Division, adjacent to the Yakima project.

The successful bid was the lowest of five received. The contractor must complete the dam within 550 days.

The Roza Diversion Dam will have an overflow section on either side of the center pier.

In addition to the dam, the contract

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also covered construction of 1600 feet of bench flume, 28 feet in width, at the head of the canal, and a railroad bridge for the Northern Pacific crossing near the head of the canal.

Construction of the Yakima Ridge Canal, and tunnels along the canal, is well advanced.

Atkinson Low on Hansen Dam

Guy F. Atkinson was low bidder for construction of Hansen Dam in Los Angeles County. His bid of $5,688,000 was over $750,000 below any of the others submitted.

An earthfill structure, Hansen Dam will be the first major construction in Los Angeles County under the recent Congressional flood control appropriation. The dam will be 110 feet high, with a maximum crest length of 9,050 feet. Dam construction will involve handling about 13,300,000 yards of earth. Maximum toe width will be 1,000 feet, crest width will be 30 feet.

The basin created by the dam will have a storage capacity of 57,000 acre-feet. Four gates and two open outlets will maintain a constant outflow of 3,200 acre-feet. Above the outlet will be a spillway, to be used only in case of record floods.

Rock Island Dam Fish Traps

By GRACE KIRKPATRICK

Many new angles of excavation besides that already finished and that being done on the Grand Coulee dam project proper, develop in connection with the vast undertaking. Just recently in the call for bids issued for the construction of fish traps at Rock Island dam, as part of the salmon control system made necessary by the building of Grand Coulee, it was announced that the contractor will be called upon to excavate over 2000 yards of material, to place about 2,165 yards of concrete, and to install 190,680 pounds of reinforcement bars, 91,250 pounds of structural steel and 73,500 pounds of gates, machinery and other equipment. There will also be some electrical work and considerable drilling to be done. Bids will close at the bureau of reclamation offices at Denver, September 2.

● At the left is the new mixing plant Consolidated Builders, Inc., are putting up to replace the east and west "houses of magic" which prepared concrete for the low dam at Grand Coulee.

The fish traps are the hope of the migratory fish control system by which the vast salmon runs of the Columbia River will be saved when the completed height of the Grand Coulee dam makes it impossible for this king fish of western rivers to fight its way upstream to the inland waters where the salmon return in cycles of four years to spawn. The fish will be helped over Rock Island dam with fish ladders, will be trapped there and taken in huge refrigerator trucks to Leavenworth, Wash., where they will be held until they have spawned. The eggs will be hatched in a hatchery and the young fry released in rivers tributory to the Columbia below Grand Coulee. As salmon return to their birthplace, it is expected and hoped that after four years have elapsed the fish will voluntarily return to these accessible rivers and no longer attempt to reach streams in the upper Columbia Basin which will be cut off by the insurmountable size of the completed dam.

Anti-Diversion Progress

Constitutional amendments prohibiting the use of special motor vehicle taxes for other than highway purposes will be voted on at the 1938 Fall elections in Alabama, California, Michigan and New Hampshire.

In both Alabama and California constitutional amendments are adopted by the legislature and submitted to the people at the next general election.

More than 209,000 voters in Michigan signed the petition which initiated placement of the proposed amendment on the November ballots. That total is approximately 20 per cent above the required number.

The New Hampshire Constitution, differing from the majority of states, provides for the Legislature submitting the question of holding a constitutional convention to the voters. If constitutional revision is favored, the Legislature then calls a convention which

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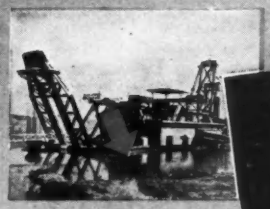
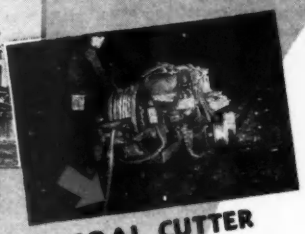


GOLD DREDGE



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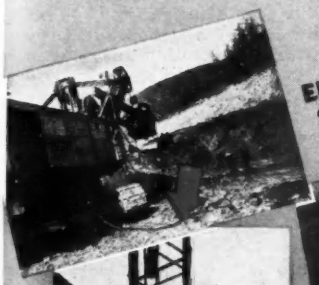
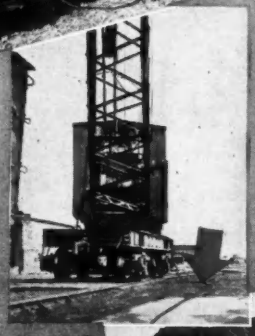
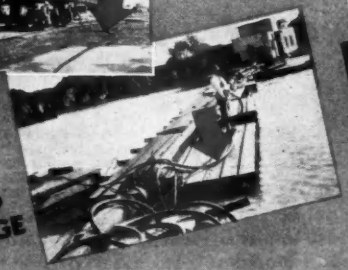
ELECTRIC SHOVEL



COAL LOADER



CRANE



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The constant increase in size of electric shovels and dredges has made the task of selecting a type of trailing cable difficult. Voltage, loading cycles, heating, regulation, protection to workmen, economics—all these factors must be taken into account.

Shielded Type SH-A portable cable for shovel or dredge

You profit most when the cable is right for each job. To this end, make full use of the services of a G-E cable specialist and get the most for your cable dollar. He can help in the selection of the right type—for long-term economy. Address nearest G-E jobber or sales office or General Electric, Dept. 6—201, Schenectady, N. Y.

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considers amendments proposed by the delegates. Such a convention was held in New Hampshire last spring and favorably considered an anti-diversion amendment which goes to the people for vote this fall.

The Legislatures of Indiana and Nevada passed Constitutional amendments in 1937. In both states, however, these amendments must be approved by the next Legislatures before being voted on by the people.

Rolling Bridge Solves Problem

By JOHN R. MARCY

One of the world's longest fence construction jobs which stretches for 152 miles along the Colorado River Aqueduct involved the problem of transporting concrete across the 60-foot open canals. Steel posts 12 feet apart set in concrete were erected on both sides of the canals, and it meant both speed and economy to carry forward both sides simultaneously. To solve the problem the ingenious rolling bridge shown in the illustration was designed and built by Garlinghouse Bros. of Los Angeles, for the Pittsburgh Steel Co. Concrete was carried in 6 cu. ft. carts and poured from the end of the bridge directly into the post holes. A hand crank propelled the bridge and the cart forward, and a continuous operation of concreting, post setting, and fence stringing was effected.

The fences enclose all open sections of the aqueduct. These sections include the 62 miles of open canals and the various reservoirs. Involving the erection of more than 4,848,000 pounds of steel, the fences are built of heavy steel wire mesh topped with strands of barbed wire and supported by steel posts set in concrete. Access to the various features of the aqueduct is provided by 215 gates of similar construction.

The 152 miles of 6-foot fences were fabricated and built by the Los Angeles Fencing Co., the Anchor Post Fence Co., and the Pittsburgh Steel Co. The total contract price was $413,077.

Because the water carried in the aqueduct will be used primarily for domestic purposes in the 13 cities of the Metropolitan Water District, it was necessary to enclose all open sections to prevent pollution.

● **This rolling bridge was used in transporting concrete across 60-foot aqueduct canals in fence construction. Pneumatic tires slanted to right angles with canal sides held the bridge frimly in place and provided easy mobility.**

The Anchor Post Fence Co., and the Pittsburgh Steel Co. built canal fences, while the Los Angeles Fencing Co. enclosed the reservoirs.

Coming Conventions

The 1939 American Road Builders' Association Convention and Highway Exhibit will be held in San Francisco during the early part of March, 1939, according to C. D. Macpherson, member of the board of directors and executive committee of the manufacturers' division of the A.R.B.A.

The exhibition will be staged in the spacious Civic Auditorium. The latest in road-building equipment, materials and methods will be displayed and dramatized for the show visitors. The convention and highway exhibit takes place soon after the opening of the Golden Gate Exposition.

The American Association of State Highway Officials will hold their annual convention at Dallas, Texas, December 5 to 9, 1938.

The Montana National Bituminuous Conference is scheduled to meet at the Edgewater Gulf Hotel, Biloxi, Miss., October 10 to 13, 1938.

August Error

The cover of Excavating Engineer showed a part of a highway job being done by Barker Brothers of Denver. The picture was all right, but how wrong the descriptive caption was can perhaps best be told in the words of a reader from Santa Fe, New Mexico, who says:

". . . the description is incorrect in three instances which are as follows: 1—The correct title is Sandia or Ellis Loop" (not Loup); 2—It starts at Bernalillo which is 17 miles north of Albuquerque, or approximately 500 miles from Denver" (the location named for the road in the caption); "3—No point on the Barker Brothers job was higher than 8500 feet above sea level." (Further description on the contents page gave the altitude at 11,000 feet).

Our apologies!

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(taken from page 539)

BUCYRUS-ERIE 34-B Diesel Chain crowd shovel. Special 1½-yd. dipper. Caterpillar Diesel D-11,000 6 cylinder 5¼"x8" engine. 30" cat. treads. Wired for electric lights. Excellent condition. Located Chicago. Box 2129-SS

For other bargains in shovels, draglines, cranes, locomotives, trenchers, and miscellaneous contractors' equipment turn to pages 539 to 542.

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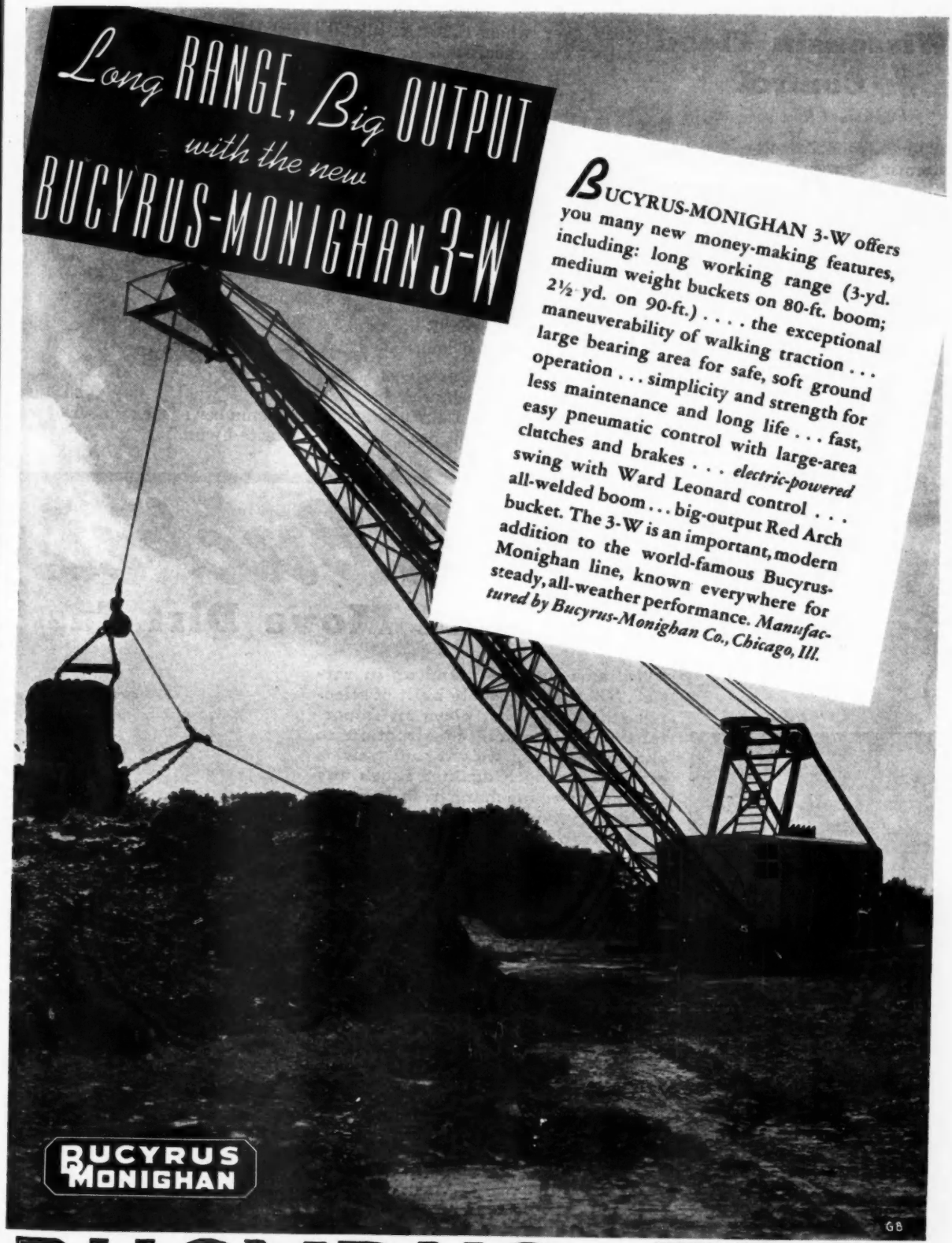
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Wisconsin Flood Control

(Continued from page 509)

220-volt, 20 H.P. motor. A double vibrating screen; driven by a 2 H.P. motor, discharged the aggregate into 3-compartment, 75-ton capacity storage bins. A similar plant was operated by the County.

When C.W.A. funds gave out in March, 1934, work was halted until further financing could be obtained through the Federal Emergency Relief Administration. Still later, the County section of the work was handled with C.C.C. labor, and W.P.A. funds took over when F.E.R.A. allotments were exhausted.

Control Dam to Be Built

Upon completion of the southern channel by the County, the C.C.C. forces will begin construction of a reinforced concrete dam on the downstream side of the project. The dam will be used to maintain a constant water level throughout the excavated area, providing for boating and bathing facilities, as well as general beautification of the area. River banks will be graded and landscaped.

For the City Bureau of Engineers, E. A. Knebes, Assistant City Engineer, is in direct charge of this flood control project. Edward Busse is program foreman, and Arthur Ziegenhagen is engineer. Planning Engineer Eugene Howard is in charge of the County work, with Lieutenant Robinson supervising C.C.C. Company 1699.

A traffic policeman at a busy crossing saw an old lady beckon to him one afternoon. He held up a dozen motor cars, a dray and two cabs to get to her side.

"What is it, ma'am?" he said rather impatiently.

"Officer," she said in a soft voice, "I want to tell you that your number is the number of my favorite hymn."

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WHITCOMB LOCOMOTIVES GO TO DUTCH GUIANA JUNGLES

This is one of two new model, 6-ton, Diesel-powered Whitcomb Locomotives recently shipped to Dutch Guiana Mines in the heart of the jungles. The track system for this operation is of necessity very temporary in nature. The heat and humidity reaches a point seldom, if ever, experienced in the United States. Notwithstanding the unusual conditions, these locomotives will be manned by natives, which is a tribute to Whitcomb simplicity and dependability. Whitcomb Locomotives of 18-ton capacity will be used to haul ore to the mill.

For over 65 years, Whitcomb Locomotives have been doing tough haulage jobs efficiently and economically. Find out how Whitcomb haulage will save you expense. Let our engineers survey your needs and make recommendations without obligation.

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NOT in the Contract

A minister was known by a few of his parishoners to be fond of Cherry Brandy and one of them in a mischievious frame of mind offered to present him with a bottle on condition that it was fully acknowledged in the next issue of the Church Magazine. The offer was promptly accepted and in due course the notice appeared in the magazine: "The Vicar thanks Mr. McTavish for his gift of fruit and the spirit in which it was given."

Mrs. Flannigan—Sure, I just got a letter from Barney, sayin' he would be let out of jail tomorrow; he got a month off for good behavior.

Mrs. Murphy—A month off for good behavior, is it? Faith, and that's a lad to be proud of.

Salesman—Boy, I would like to see some one with a little authority.

Office Boy—What can I do for you? I have about as little as anyone.

Lizzie, from a Mid-Wales village, became a chambermaid at a large hotel in London. A duchess was expected to arrive, and the manager was giving her final instructions.

"When you speak to this lady always say 'Your Grace' " said he.

When the duchess arrived, Lizzie was heard to say:

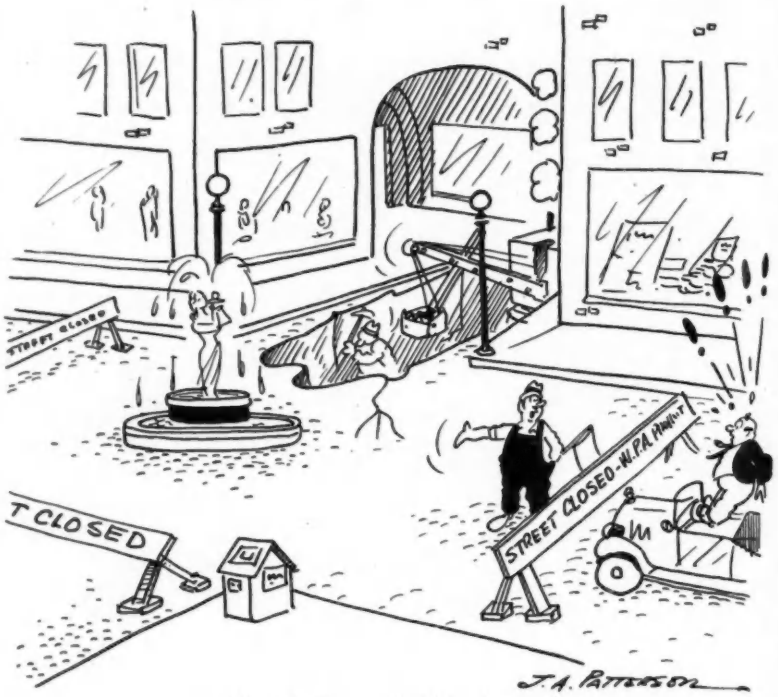
"This way, madam, and for what we are about to receive may the Lord make us truly thankful."

Two married men, out for a good time, saw a couple of young women approaching, some distance away.

"Let's pick up these two girls," said one.

But as the girls drew nearer the second man said, "Gosh, no,—that's my wife and my sweetheart."

"Funny," said the first man, "you took the words right out of my mouth."



"We gotta increase the flow of water."

A temperance lecturer ended his speech with: "Some people advocate total abstinence, whilst others suggest moderation. But, I ask you, my friends, what is the all-important Drink question?"

From the back of the hall came the reply: "What'll you have?"

A "beautician" says women will be wearing topless bathing suits within three years. It would be novel to see them breasting the waves, and vice versa.

Installment Collector: "Hello there young man. Is your mother or father at home?"

Little Jackie: "They are both out, and they said for you to call again Friday."

Collector: "H'm, and why on Friday, my little man?"

Little Jackie: "That's what I don't know, sir. We're moving Thursday."

First Student: "I wonder how old Miss Jones is?"

Second Student: "Quite old, I imagine. They say she used to teach Caesar."

Hotel Clerk—"Inside or outside room, sir?"

Guest—"Inside, I guess; it looks like rain."

A medical student who had been out on a big party until about 5:00 A.M., sat in a classroom trying to pass an exam. His head was fairly buzzing with the hangover from the party, and he could just about see the paper.

The first question was: Name five reasons why mother's milk is better for babies than cow's milk.

The student scratched his head and put down:

1—It's fresher.

2—It's cleaner.

Then he thought a while and wrote:

3—The cats can't get at it.

4—It's easier to take to a picnic.

Well pleased with the results he had so far achieved, he studied long on the last reason. Finally he had an inspiration. The next day the professor read the fifth reason:

5—It comes in such cute containers.

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Book reviews

The Sullivan Machinery Company has released literature descriptive of a new type of core drilling bit known as the Kobelite Korbit. In terms of bit cost per foot of hole drilled, savings of 15 to 20 per cent are claimed in comparison with any other type of bortz set core drill bit. Faster drilling speed and greater footage per bit are also claimed.

Copies of descriptive literature can be secured from Sullivan Machinery Company, Michigan City, Indiana.

Ninety-seven different models of Diesel engines are described in the new Diesel Engine Catalog, volume III. Beautifully illustrated in color, with sectional drawings visualizing with clarity the design features of each engine, this new book brings its readers an exceptionally clear picture of the Diesel engines now on the market. The catalog is authoritative, informative, beautifully printed and bound—copies of Diesel Engine Catalog may be obtained from Diesel Progress, 2 West 45th Street, New York, New York. Price $3.00 postpaid.

The United States Department of the Interior announces the publication of the 1938 edition of the Minerals Yearbook. This volume chronicles one of the most eventful years in the history of the minerals industry—one that, in spite of a drastic decline during the closing months of 1937, registered a return for the first time to the level of activity established in the boom year of 1929. For a full account of the operations and interrelations of the mineral industry the Minerals Yearbook is the earliest and most complete reference available. Cloth bound copies may be obtained for $2.00 from the Superintendent of Documents, Washington, D. C.

A new bulletin has recently been published which illustrates and describes the complete line of Rex construction equipment which the Chain Belt Company, Milwaukee, Wisconsin, manufactures for the contracting industry. Outstanding among this equipment is the Rex 160 Pumpcrete, "the pump that pumps concrete" which is now offered to the contractor whose jobs are usually less than 5,000 cubic yards. Copies will be mailed directly to interested readers by the manufacturer.

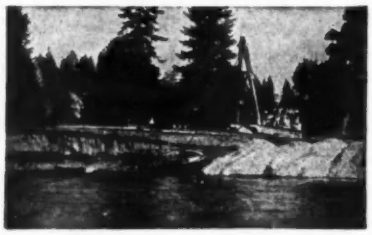
The Magnus Chemical Company, Garwood, New Jersey, have prepared a new folder which describes a new cement cleaning compound of their manufacture. Complete directions for the use of the cleaner are contained in the folder. Readers may obtain their copies by writing directly to the manufacturer.

Trade notes

John A. Roebling's Sons Company announces the establishment of a branch office and warehouse at 855 North Avenue, West, Pittsburgh, Pennsylvania, to carry a complete line of wire rope and insulated wire.

Clausen and Company, subway engineers and surveyors, and F. M. Beers, engineer, have recently moved to 20 N. Wacker Building, Chicago.

SAUERMAN
LONG RANGE MACHINES



Sauerman Slackline Scraper drags gravel from river and builds revetment.

FIRST cost of a Sauerman Slackline or Drag Scraper machine adapted to the average long range job, is less than that of other equipment capable of digging, hauling and placing an equal yardage. Operating and maintenance expense is low, too.

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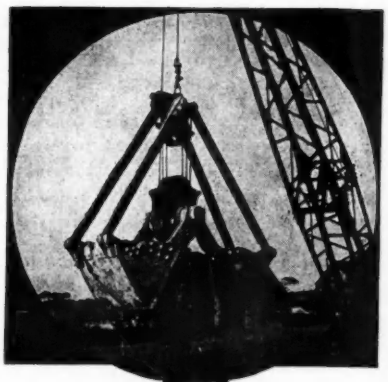

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TRUCK CRANES and SHOVELS

UNIVERSAL GAS TRUCK CRANE. Full revolving. 20' boom. ⅝-yard Kiesler clamshell bucket with teeth. 4-wheel Mack truck. 4-cylinder 4¾"x6½" engine. Good operating condition. Located Chicago. Box 2071-SCC.

UNIVERSAL—THEW Model AC-35, ½-yard gasoline truck crane. 28' boom. ½-yd. Owens digging bucket. Mack truck equipped with dual hard tires rear and pneumatic tires front. Condition good. Located Central New York State. Box 1193-SCC.

SMALL SHOVELS
Under 2 Yards

⅜-YARD

BUCYRUS-ERIE 10-B Gasoline shovel. Electric starter. 14" cat treads. Hercules engine, excellent condition, and 10-B trailer good as new. Located North Carolina. Box 2182-SS

NORTHWEST MODEL 3 combination gas shovel and dragline. Good operating condition. Located near Detroit. Box 2190-SS.

WILFORD COMBINATION gas shovel and dragline. High altitude engine. Good operating condition. Located Colorado. Box 2191-SS.

½-YARD

BUCYRUS-ERIE — TYPE A, ½-yard steam shovel. Cat mounted. 26' boom clamshell equipment. Located Central Illinois. Box 2007-SS.

P&H MODEL 300 gas shovel. 19' boom. 13'3" dipper handle. ½-yard dipper. Buda 4½"x6" —6-cylinder engine. Machine shop reconditioned. Price reasonable. Located Kentucky. Box 2192-SS.

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⅝-YARD

BUCYRUS-ERIE TYPE AA ⅝-yard Air Tunnel shovel cat. mounted. Two speeds. Will work in 14' clearance. Reconditioned. Excellent condition. Located New York. Box 2180-SS

BYERS MODEL 128. ⅝-yd. gas shovel and 35' boom dragline, including ½-yd. Page "C" drag bucket. 4-cylinder Diamond T engine. Engine overhauled 1937. Good operating condition. Located Illinois. Box 2087-SS.

GENERAL—⅝-yd. Gas shovel. Cood condition. Located Eastern Pennsylvania. Box-2104-SS.

¾-YARD

BUCYRUS-ERIE TYPE B ¾-yd. Caterpillar mounted steam shovel. Located Massachusetts. Box 2123-SS

BUCYRUS-ERIE TYPE B Steam Shovel. ¾-yard Quarry dipper. Cat mounted. New boiler installed late 1935. Good operating condition. Located Georgia. Box 2073-SS.

BUCYRUS-ERIE —— TYPE B, ¾-yard steam shovel and 40' boom clamshell. Cat. mounted. Located Buffalo, New York. Box 2005-SS.

LORAIN MODEL 40—¾-yd. Gas shovel. 16 mo. old. Excellent condition. Located Eastern Pennsylvania. Box 2103-SS.

OSGOOD. COMMANDER. Combination shovel, dragline and clamshell. ¾-yard Rock Type dipper. 35' dragline and clamshell boom. ¾-yard Page drag bucket. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SS.

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⅞-YARD

BUCYRUS-ERIE B-2. Extra High Lift shovel. 21'3" boom. 18'4" dipper handle. ⅞-yard dipper. Well cared for. Good condition. Located Rhode Island. Box 2047-SS.

BUCYRUS-ERIE B-2 High Lift Steam Shovel. Single Shaft Cat. Exceptionally good condition. Located Connecticut. Box 2078-SS.

BUCYRUS-ERIE — 1035 GASOLINE SHOVEL. Chain Crowd. ⅞-yard Dipper. 26-in. caterpillar treads. Electric starter. Needs some repairs. Located vicinity Boston. Box 1065-SS.

BUCYRUS-ERIE — B-2 — HIGH LIFT STEAM shovel. 21'3" boom, 16' dipper handle, ⅞-yard dipper. Single shaft caterpillar. Located Vermont. Box 1135-SS.

1-YARD

BUCYRUS-ERIE 32-B Gasoline combination shovel and 40' boom clamshell. Electric starter. Wisconsin M-3 6-cylinder 5"x6" engine. Excellent condition. Located Washington, D. C. Box 2184-SS

BUCYRUS-ERIE 32-B—Gasoline chain crowd 1-yard shovel. Electric starter. Single shaft cats. Wisconsin 6-cylinder 5"x6" engine. Few minor repairs needed. Otherwise excellent condition. Located near Boston. Box 2061-SS.

BUCYRUS-ERIE — D-2 1 yard Diesel Shovel. Atlas engine. Field reconditioned. Located North Carolina. Box 1079-SS.

BUCYRUS-ERIE 1030 — ELECTRIC TUNNEL shovel. Boom 10 ft. 7 in. Dipper handle 10 ft. 5 in. 1-yd. dipper. Boom hoist 5 ft. 6 in. rear end clearance. 2 motor—power supply 3 phase, 60 cycle, 440 volt. Located Virginia. Box 1068-SS.

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BUCYRUS-ERIE—31-B STEAM SHOVEL. 22' boom, 15' dipper handle, 1-yard dipper. Now operating, can be demonstrated. Located Alabama. Box 1130-SS.

LORAIN—MODEL 60—1-YARD shovel. Located Southern Virginia. Box 1182-SS

MARION MODEL 7, 1-yard steam shovel. Has not operated in the past five years. New flues recently installed in boiler. Located Buffalo, New York. Box 2006-SS.

NORTHWEST — MODEL 105 — GASOLINE shovel and clamshell—1-yard. Located Massachusetts. Box 1123-SS.

P&H MODEL 600 1-yd. Gasoline shovel. Waukesha engine. Crane equipment also available. Good condition. Located Connecticut. Box 2113-SS

1¼-YARD

BUCYRUS-ERIE 34-B Diesel combination 1¼-yard shovel and 45' boom dragline including 1¼-yard drag bucket and Kohler light plant. 30" cat. treads. Caterpillar D-11,000 engine. Used only about 8 months. Excellent condition and appearance. Located Kansas. Box 2172-SS

BUCYRUS-ERIE GA-3 Gas-Air 1¼ yard shovel. Single shaft cat. Electric starter. Waukesha 4-cylinder 6¼"x8" engine. First class condition. Located near St. Louis. Box 2162-SS.

BUCYRUS-ERIE 34-B Diesel Chain crowd shovel. Special 1½-yd. dipper. Caterpillar Diesel D-11,000 6 cylinder 5¼"x8" engine. 30" cat. treads. Wired for electric lights. Excellent condition. Located Chicago. Box 2129-SS

BUCYRUS-ERIE GA-2 Gas-Air shovel. Single shaft cat. Waukesha 6¼"x8" 4-cylinder engine. $3,000 repairs added June 1937. Excellent condition. Located Kansas. Box 2126-SS

BUCYRUS-ERIE GA-3 Gas Air 1¼-yd. shovel. Waukesha 4-cylinder 6¼"x8" engine. Good operating condition. Now operating Arizona. Box 2090-SS.

BUCYRUS-ERIE GA-2 Gas-Air 1¼-yd. shovel. Waukesha 6½"x8" engine. Single shaft cat. General appearance and condition good. Located North Carolina. Box 2108-SS.

BUCYRUS-ERIE. GA-2, Gas-Air. 1¼-yard shovel. Electric starter. Waukesha W.L. 4-cylinder 6¼"x8" engine. Single shaft cat. Extensively repaired recently. Located Texas. Box 2030-SS.

FOR SALE

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SMALL SHOVELS
Under 2 Yards continued

BUCYRUS-ERIE E-2 shovel and dragline. 1½-yard Plate dipper. 45' boom plus 10' extension. 1¼-yard Page drag bucket. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SS.

TWO—BUCYRUS-ERIE—GA-3, GAS-AIR 1½-yard shovels. Wisconsin D-2—6 cyl. 5¼"x6½" engines. Good condition. St. Paul, Minnesota. Box 1097-SS.

BUCYRUS-ERIE 41-B — 1¼-YARD STEAM SHOVEL. Located near Boston. Electric light plant. Very good price. Box 1096-SS.

BUCYRUS-ERIE—41-B—STEAM SHOVEL. 21' boom, 15' dipper handle, 1¼-cubic yard dipper. Now operating. Will demonstrate. Located Alabama. Box 1131-SS.

BUCYRUS-ERIE GA-3—Gas-Air 1¼-yard high lift shovel and 45' boom clamshell machine. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Located New Mexico. Box 2148-SS.

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LIMA MODEL 101. 1¼-yard gas shovel. 50' boom dragline. Excellent condition. Located Texas. Box 2029-SS.

2—LIMA MODEL 101. 1¼-yard gasoline shovels. 26' boom. 17' dipper handle. Waukesha Model J. K. 6½"x7" engine. Recently rebuilt. Excellent condition. Located Texas. Box 2042-SS.

LORAIN 75-A 1¼-yd. Gas shovel. Good operating condition. Located near Boston. Box 2118-SS

2 MARION Model 450—Steam Shovels. Good condition. Located Connecticut. Box 1154-SS.

MARION MODEL 32—1¼-yd. steam shovel. Boiler inspected February 1, 1938. Machine in good condition. Located Eastern Pennsylvania. Box 2101-SS.

OSGOOD. 1¼-yard gasoline shovel. 1-yard dipper also available. 4-cylinder Leroi gas engine. Only operated three months since $2,000 repairs applied. Excellent condition. Located Texas. Box 2043-SS.

1½-YARD

BUCYRUS-ERIE 37-B Diesel Chain crowd shovel. 1½-yd. 30" cat. treads. Caterpillar D-13,000 6-cylinder 5¾"x8" engine. Wired for lights. Practically new condition. New machine guarantee. Available 30 days. Located Western Pennsylvania. Box 2128-SS

BUCYRUS-ERIE 37-B Gas 1½-yd. shovel. Electric starter and battery lights. Gasoline fuel pump. Wisconsin 6-cylinder 5½"x6½" engine. Machine rebuilt 1933. Good working condition. Located Eastern Pennsylvania. Box 2091-SS.

BUCYRUS-ERIE—42-B STEAM shovel. 1½-yard Vanderhoef quarry dipper. Very good mechanical condition. Can be demonstrated. Located Georgia. Box 1149-SS.

BUCYRUS-ERIE 37-B—1½ yard Chain crowd gas shovel. Wisconsin D-3 engine. Located Minnesota. Box 2075-SS.

LORAIN 75-B gas shovel. Machine shop reconditioned. Located Southern Wisconsin. Box 2189-SS.

P&H MODEL 700-B. 1½-yd. Gasoline shovel. Waukesha engine. Good condition. Located Connecticut. Box 2114-SS.

1¾-YARD

BUCYRUS-ERIE 43-B Gasoline chain crowd shovel. 22' boom. 17' dipper handle. 1¾-yard dipper. Also 60' boom dragline equipment including 1¾-yard AX drag bucket. Wisconsin 6-cylinder 6"x7" engine. Used less than 90 days. Excellent condition. Located northern California. Box 2185-SS

BUCYRUS-ERIE 43-B late model 1¾-yd. chain crowd shovel. Electric starter. 1½ K.W. Kohler light plant. Buda-Lanova 6-cylinder 5¼"x7" Diesel engine. Located Central New York State. Excellent condition. Box 2019-SS.

5—MARION MODEL 37, 1¾-yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 2153-SS.

2-YARD

BUCYRUS-ERIE 48-B chain crowd Diesel shovel. Excellent condition. Located Ohio. Box 2187-SS.

MARION MODEL 480—2-yd. Steam shovel. Vertical boiler. Boiler inspected February 1, 1938. Excellent condition. Located Eastern Pennsylvania. Box 2102-SS.

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

NORTHWEST MODEL 3 combination gas dragline and shovel. Good operating condition. Located near Detroit. Box 2190-SD.

WILFORD COMBINATION gas dragline and shovel. High altitude engine. Good operating condition. Located Colorado. Box 2191-SD.

½-YARD

UNIVERSAL GASOLINE dragline. ½-yd. capacity. Crawler mounted. Located Indiana. Box 2127-SD

⅝-YARD

DYERS MODEL 128. ⅝-yd. Gas dragline 35' boom including ½-yd. Page "C" drag bucket. 4-cylinder Diamond T engine. Engine overhauled 1937. Good operating condition. Located Illinois. Box 2087-SD.

¾-YARD

AUSTIN MODEL "MA"—Gasoline Dragline—37' Boom—¾ yd. Page "M" drag bucket. Good operating condition. Located western Nebraska. Box 2198-SD.

NORTHWEST MODEL 105 GAS—40' boom dragline and clamshell, including Page "C" drag bucket. Climax engine. Reasonably good operating condition. Located Atlanta, Ga. Box 995-SD.

OSGOOD. COMMANDER. Combination dragline, shovel and clamshell. 35' dragline and clamshell boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2088-SD.

⅞-YARD

BUCYRUS-ERIE 1035 Gasoline 40' boom dragline and clamshell, including 1-yd. dragline and clamshell buckets. 26" cat. treads. Waukesha engine. Recently overhauled. Located Colorado. Box 2177-SD

1-YARD

BUCYRUS-ERIE 30-B Diesel 40' boom dragline. Atlas Diesel 3-cylinder 8½"x10½" engine. $1,500 repairs recently applied. Excellent condition. Located near Chicago. Box 2132-SD

BUCYRUS-ERIE 32-B Gas 50' boom dragline and 1-yd. "U" Drag bucket. Electric starter. Wisconsin engine. Good operating condition. Located Eastern Pennsylvania. Box 2088-SD.

BUCYRUS-ERIE — D-2 — DIESEL DRAGLINE. Atlas engine. Located Texas. 40' Boom, 1¼ yd. Page Bucket. Field reconditioned. Excellent mechanical and operating condition. Box 1020-SD.

1¼-YARD

BUCYRUS-ERIE 34-B Diesel combination 1¼-yd. 45' boom dragline and shovel, including 1¼-yd. drag bucket and Kohler light plant. 30" cat. treads. Caterpillar D-11,000 engine. Used only about 8 months. Excellent condition and appearance. Located Kansas. Box 2172-SD

BUCYRUS-ERIE E-2 Diesel 45' boom dragline and 1¼-yard Page bucket. Fair working condition. Located Kansas. Box 2173-SD

BUCYRUS-ERIE E-2 dragline and shovel. 45' boom plus 10' extension. 1¼-yard Page drag bucket. 1½-yard plate dipper. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SD.

LIMA MODEL 101, 1¼-yd. gas 50' boom dragline and shovel. Excellent condition. Located Texas. Box 2029-SD

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South Milwaukee, Wis.

P & H—MODEL 210—55' boom dragline including 1¼-yard Page bucket. Gas powered. Located South Dakota. Box 1172-SD

1¾-YARD

BUCYRUS-ERIE 43-B gasoline 60' boom dragline, including 1¾-yard AX drag bucket. Also certain crowd shovel equipment. 22' boom. 17' dipper handle. Wisconsin 6-cylinder 6"x7" engine. Used less than 90 days. Excellent condition. Located Northern California. Box 2185-SD

2-YARD

BUCYRUS-ERIE 45-B Diesel Dragline. 75' boom. Buda DC-27 6-cylinder 6¼"x8¾" engine. Electric starter. 2¼ yd. Omaha drag bucket. Long cat side frame. Kohler light plant. Good operating condition. Located Nebraska. Box 2111-SD.

FOR SALE

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SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY—⅜-YARD GAS CLAMSHELL. Located near Boston. Box 1084-SCC.

½-YARD

BUCYRUS-ERIE — TYPE A, ½-yard steam clamshell and shovel. 26′ clamshell boom. Cat. mounted. Located Central Illinois. Box 2007-SCC.

⅝-YARD

BROWNHOIST 40′ boom steam locomotive crane. Standard gauge car wheel mounting. Fair condition. Located vicinity Chicago. Box 2135-SCC

P & H MODEL 204. 35′ boom gasoline clamshell. ¾-yard Kiesler clamshell bucket. Waukesha engine. New cab. Generally very good condition. Located Chicago. Box 2036-SCC.

¾-YARD

BUCYRUS-ERIE—TYPE B, ¾-yard, 40′ boom steam clamshell and shovel. Cat. mounted. Located Buffalo, New York. Box 2005-SCC.

NORTHWEST MODEL 105 GAS — 40′ boom clamshell and dragline, including Page "C" drag bucket. Climax engine. Completely reconditioned. Located Atlanta, Ga. Box 995-SCC.

⅞-YARD

BUCYRUS-ERIE 1035 Gasoline 40′ boom clamshell and dragline including 1-yd. clamshell and dragline buckets. 26″ cat. treads. Waukesha engine. Recently overhauled. Located Colorado. Box 2177-SCC

1-YARD

BROWNHOIST 50′ boom steam locomotive crane. Standard gauge car wheel mounted. Overhauled 1937. Located vicinity Chicago. Box 2136-SCC

BUCYRUS-ERIE 32-B gasoline combination 40′ boom clamshell and shovel. Electric starter. Wisconsin M-3 6-cylinder 5″x6″ engine. Excellent condition. Located Washington, D.C. Box 2184-SCC

BUCYRUS-ERIE — GA-2 — GAS-AIR 45′ Boom Clamshell Machine Good Operating Condition. Located St. Paul, Minn. Box 1024-SCC.

BUCYRUS-ERIE — GA-2 GAS AIR Clamshell. 45′ boom. Single Shaft Caterpillar. Waukesha 4 cylinder 6¼″x8″ engine. Rebuilt since original manufacture. Good operating condition. Located New Jersey. Box 1104-SCC.

NORTHWEST—MODEL 105—gasoline clamshell and shovel—1-yard. Located Massachusetts. Box 1123-SCC.

P&H MODEL 600, 1-yd. gasoline shovel. Crane equipment also available. Waukesha engine. Good condition. Located Connecticut. Box 2113-SCC

P. & H. MODEL 600—40′ BOOM GAS clamshell and 1-yard shovel. Waukesha JL-6″x7″ Engine. Located North Carolina. Box 1095-SCC.

1¼-YARD

BUCYRUS-ERIE GA-3 — Gas-Air 1¼-yd. 45′ boom clamshell and high lift shovel. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼″x8″ engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SCC.

LINK-BELT, MODEL K-2. Gas crane. 50′ boom. Also 2 extra 20′ inserts to make 90′. Weight 67,000 lbs. Located St. Paul, Minn. Box 2013-SCC.

1½-YARD

2—BUCYRUS-ERIE 37-B's Gasoline Special Clamshell Machines. Vertical Tagline. Accelerator control on engine. Special hoist gear and pinion to increase line speed. 30″ Cat. treads. Electric starter. 10,000-lb. counterweight. Wisconsin "E" 6-cylinder 6″x7″ engine. Good operating condition. Located Boston. Box 2160-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

BUCYRUS-ERIE 50-B, 2-yd. steam shovel. Good operating condition. Located Central New York State. Box 2020-LSD.

BUCYRUS-ERIE 50-B steam high lift shovel and 60′ boom dragline. Electric light plant. Good operating condition. Located Eastern Pennsylvania. Box 2188-LSD.

BUCYRUS-ERIE 50-B Diesel Dragline. 50′ boom. 2-yard Page "M" drag bucket. Kohler Light Plant. Atlas Engine. Overhauled completely 1937. Actually used only 4 years. Good condition. Located Illinois. Box 2083-LSD.

BUCYRUS-ERIE 50-B Diesel Combination shovel and dragline. New 1¾-yd. Esco dipper. 50′ dragline boom including 1½-yd. Page drag bucket. Atlas 4-cylinder 9″x12″ engine. Good working condition. Located Montana. Box 2107-LSD.

BUCYRUS-ERIE — 52-B — DIESEL 2¼ yard Shovel and Dragline. Atlas engine. Good condition. Located Eastern Pa. Box 1039-LSD.

BUCYRUS-ERIE 55-B—Extra High Lift Diesel Shovel. 35-ft. boom, 22-ft. dipper handle, 2 cu. yd. Bowl Door dipper. Caterpillar mounted. Kohler light plant. Atlas Diesel engine. Used about three months. Just like new. Located Eastern Pennsylvania. Box 1069-LSD.

BUCYRUS-ERIE — 75-B Electric Combination Shovel and Dragline. 29-ft. shovel boom, 20-ft. dipper handle, 2½-yard dipper, 85-ft. dragline boom with mast suspension. Suitable for power supply, 3 phase, 60 cycle, 2300 volt. Induction motors. Said to be in excellent working condition. Located Eastern Pennsylvania. Box 1058-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 2164-LSD.

BUCYRUS-ERIE—CLASS 24 DIESEL dragline. 130-ft. boom, 4 cu. yd. bucket. Truck mounted. 165 h.p. Anderson Diesel engine. Friction drive. Said to be in good operating condition. Located on Mississippi River near New Orleans convenient for loading on barge. Box 1074-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard buckets. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 2149-LSD.

BUCYRUS-ERIE 95-C. 3-yard steam shovel. Cats. installed 1925. Fair condition. Located Kansas. Box 2050-LSD.

BUCYRUS-ERIE — 100-B — STEAM SHOVEL. 3 yard Dipper. Revolving machinery, very good condition. Located Montreal, Canada. Box 1041-LSD.

2—BUCYRUS-ERIE 100-B steam shovels, worked only 15 months. Also, 2 Ingersoll-Rand Diesel compressors. Very low prices for immediate sale. H. W. Nelson, 1 Wall St., New York.

BUCYRUS-ERIE 100-C. 3-yard steam shovel. Cat. mounted. Fair condition. Located Kansas. Box 2049-LSD.

BUCYRUS-ERIE 175-B 2 Motor AC Electric Dragline. Truck Mounted. 125′ boom. 1 each 4-, 5-, and 6-yd. drag buckets. Chain drive from main motor to intermediate shaft. Extra rotors for main and swing motors and other spare parts. 3—75 KVA 60 cycle 2200/220/440 volt transformer mounted on machine. Power supply 3 phase 60 cycle 440 volt. Completely overhauled since received from factory. First class operating condition. Located Kansas. Box 2082-LSD.

COAL MINE SHOVELS

MARION MODEL 250 STEAM SHOVEL (less dipper handles) with 3 cu. yd. dipper. Also Sullivan 9x12x10 air compressor and receiver.

BUCYRUS 27-D STEAM horizontal thrust coal loader 1½ cu. yd. capacity.

BUCYRUS 225-B ELECTRIC SHOVEL, Ward--Leonard control, with Model 320-B electric machinery. 80′ boom, 52′ handles. 8 cu. yd. dipper.

All in first class serviceable condition. Available for immediate dismantling. Located near Ft. Smith, Arkansas. Box 2194-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 2152-LSD.

CLASS 320 STEAM DRAGLINE, 144-foot boom. 8-yard bucket. Located on Illinois river. A good buy. Box 2155-LSD.

BUCYRUS-ERIE — TOWER EXCAVATOR. 130′ head tower. 50′ tail tower. 12-yard bottomless bucket. Electrical equipment 3 phase 60 cycle 4000 volts Ward Leonard. WILL RENT. Located Louisiana. Box 2069-LSD.

BUCYRUS-MONIGHAN 1½-T Diesel dragline. 60′ boom. Located Kansas. Box 2168-LSD

BUCYRUS-MONIGHAN 2-T Diesel Dragline. 70′ boom. Located Kansas. Box 2169-LSD

BUCYRUS-MONIGHAN 2-W Diesel dragline. 70′ boom. Located Louisiana. Box 2170-LSD

BUCYRUS-MONIGHAN 3-T Diesel dragline. 77′ boom. Located Louisiana. Box 2171-LSD

BUCYRUS-MONIGHAN 3-T DIESEL dragline. 80-ft. steel boom, 8 cu. yd. drag bucket, 120 h.p. Fairbanks-Morse type "YVA" engine. 1500 watt Kohler Light Plant. Working at Little Rock, Ark. Box 1056-LSD.

BUCYRUS-MONIGHAN—MODEL 4-W—4-yard Diesel Dragline. 110′ Boom. Good Condition. Located Nebraska. Box 1047-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline, 80′ boom 5½ yard Page bucket, 30′ boom insert and 4-yard bucket. Located Tennessee. Box 2150-LSD.

BUCYRUS-MONIGHAN 5-W Diesel Dragline. 90′ Boom. Electric swing. Vortex Air Oil Cleaners. Electric fan in operators platform. 5-yd. "Y" drag bucket. Fairbanks Morse 250 HP Type 33-D 5-cylinder 10″x10½″ pump scavenging engine. Auxiliary Waukesha gas engine. Good working condition. Located Colorado River Aqueduct near Indio, Cal. Box 2079-LSD.

BUCYRUS-MONIGHAN 5-W Diesel Dragline. 80′ Boom. Electric swing. Vortex Air Oil Cleaners. Electric fan in operator's platform. 6-yd. "Y" drag bucket. Fairbanks Morse 250 HP Type 33-D 5-cylinder 10″x10½″ pump scavenging engine. Auxiliary Waukesha gas engine. Good working condition. Located Colorado River Aqueduct near Indio, Cal. Box 2080-LSD.

FOR SALE

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LARGE SHOVELS AND DRAGLINES
2 Yards and Over continued

BUCYRUS-MONIGHAN MODEL 6160 — Diesel Dragline. 160' boom. 6-yard drag bucket. Fairbanks-Morse Diesel engine. $15,000 extras added since machine was recently purchased. Will rent. Located Montana. Box 2068-LSD.

MARION MODEL 60. 2½-yard steam shovel on railroad trucks. Good appearance and condition. Located Kansas. Box 2051-LSD.

MARION — MODEL 70-E — 3½ yard Electric Shovel. Railway truck mounted. Power Equipment, 3 Phase, 60 cycle, 2300 volt. Good condition. Located Ohio. Box 1050-LSD.

MARION—MODEL 350—6 yard Electric Shovel. Power equipment, 3 Phase, 60 cycle, 2300 volt — Ward-Leonard Control. Mounted on railway trucks. Good condition. Located Minnesota. Box 1049-LSD.

PAGE—MODEL 220—2½ yard Diesel Dragline. 85' Boom. Good operating condition. Located Iowa. Now operating. Box 1052-LSD.

PAGE — MODEL 220 — Electric dragline. 90' boom, 3½-yard Page R.C. drag bucket. Box 1124-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel, 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 2151-LSD.

LOCOMOTIVES

STANDARD GAUGE LOCOMOTIVES BARGAINS

1—Baldwin 45-ton 17x24
2—Baldwin 77-ton 19x26
9—Baldwin 51-ton 17x24
4—American 60-ton 20x26
Located in Minnesota.
Box 2147-ME.

MISCELLANEOUS EQUIPMENT

SHOVEL ATTACHMENT

1½-Yd. Dipper, Dipper Stick, Boom for Link-Belt K-44, K-38 or K-42 shovel. Used only few months. Excellent condition. Bargain Price.

ARMOUR FERTILIZER WORKS
Chicago Heights, Ill.

FOR SALE: Shovel attachment for Model 700 P&H. Excellent condition. Used very little. Martin-Day Company, Lincoln, Neb.

1 HOLT MODEL 50 Gas Tractor. Located Illinois. Box 2159-ME.

1—20-TON all steel Guy derrick. 80' mast. 75' boom complete with 6 Guy cables approximately 250' long. Includes Dake steam engine driven winch bolted on side of mast complete with load and cables. Also electric motor in addition to Dake engine. Hand swing. Also included one Westinghouse cross-compound steam driven air compressor. Approximate weight 20,000 lbs. Located Wisconsin. Box 2156-ME.

LOCOMOTIVE CRANES

4—Standard gauge locomotive cranes, three —20-ton, one—10-ton. Offered at bargain prices. Located Minnesota.
Box 2146-ME.

BROWNHOIST Steam Locomotive crane. 44' boom. 8-wheel standard gauge MCD coupling. Lifting capacity 20,000 lbs. at 20' radius. One each 1-yd. and 2-cu. yd. clamshell buckets available. Located Wisconsin. Very good condition. Box 2137-ME

COAL MINE EQUIPMENT

PRICED TO SELL. The following equipment located a short distance from Ft. Smith, Arkansas may be had at bargain prices for immediate delivery.
No. 3 Centrifugal pump with 10 h.p. motor.
4" Centrifugal pump.
8" Centrifugal pump, direct connected with 50 h.p. motor.
3" Centrifugal pump with 7½ h.p. motor.
I-R compressor with motor and receiver mounted on wagon.
3—I-R paving breakers.
Wood tipple to include 36" drag conveyor with 20 h.p. motor and switch on Conveyor, 15 h.p. motor and switch on conveyor,
15 h.p. motor & switches on shaker,
5 h.p. motor & switches on lump boom,
5 h.p. motor & switches on egg boom,
3 h.p. motor & switch on lump boom hoist.
2—10 KVA transformers.
50 tons good No. 60 relaying steel with six No. 8 turn-outs.
For full particulars, write Box 2193-ME.

BARGAIN PRICES

2—14 Cu. Yd. LaPlante-Choate Wagons
2—75 Caterpillar-Diesel Tractors
(Above equipment like new)
1—Model 71 Keystone Well Drill
1—1½ Cu. Yd. Page Dragline bucket, A-1 condition
Box 2140-ME.

NEW ELECTRIC MOTORS AND ACCESSORIES BARGAIN PRICES

A large variety of power sizes and power characteristics; also switches, controls, etc. Write us your requirements.
Box 2100-ME.

FRUEHOFF SEMI-TRAILER with 8' by 40' Deck. (Can be shortened.) Single rear axle with 4 wheels each with 36"x10" solid rubber tires. Air Brakes. 16 ton capacity. Excellent condition. Located New York. Box 1160-ME.

DRAG BUCKET

BUCYRUS-ERIE 1½-YARD Type "Y" Drag Bucket. Good condition. Located Kansas. Box 1166-ME.

DRAGLINE EQUIPMENT

72-ft. Dragline Boom and Fairlead—Hydraulic Equipment—1 Hoist Drum—1 Drag Drum—1 Boom Suspension, Sway Brace and Suspension Cables. All suitable for application to Bucyrus-Erie Model 75-B Machine. Located Eastern Pennsylvania. Box 1060-ME.

HAISS EXCAVATOR — C7097, June 1930. Weight 11 tons. Needs new teeth. 33" per minute crowding. Price $1800. Box 990-ME.

CAR TRANSPORTER

CAR-TRANSPORTER or stacker with reach of 135' and dumping height of 75'. Equipped with 4-yard aluminum car. Caterpillar-mounted and suitable for use with shovel having per hour output of 250 yards. Electric drive, 3-phase, 60-cycle, 4000-volt current. This car transporter is in excellent condition and priced to sell. Located near Kansas City, Missouri. Box 2010-ME.

SHOVEL EQUIPMENT—Late design—suitable for Bucyrus-Erie 52-B Diesel. Only handled about 4,000 yards material. Equipment located Alabama. Box 1113-ME

FRONT FOR 32 MARION

1¾ CU. YD. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 2165-ME.

INDUSTRIAL STEAM WRECKING DERRICK. Non-propel. Rating 50 tons at 20' with outriggers. Located Nebraska. Box 1171-ME

BARBER-GREENE—MODEL B-44 ditcher. Located North Carolina. Box 1180-ME

KOEHRING DRAG SHOVEL equipment for Model 301 machine. Used very little. Low price. Located Eastern New York State. Box 1181-ME

USED CONTRACTORS EQUIPMENT

1—Model 100 Lincoln Revolver with 100' boom and 12' Gantry.
2—275 Koehring Mixers with Electric motors.
1—200-ton Blaw-Knox Bin with weighing batchers, cement scale and push button control.
1—Robinson Pneumatic cement unloader with silo.
1—20-ton Whitcomb Gasoline Dinkey, overhauled.
4—18-ton Steam Dinkeys, overhauled.
12—80-yd. Western Lift Door Air Dump cars.
4—30-yd. Koppel Drop Door Air Dump cars.
26—16-yd. K. & J. Lift Door Air Dump cars.
6—20-yd. K. & J. Lift Door Air Dump cars.
5—2-cu. yd. Blaw-Knox Roller gate Concrete Buckets.
7—70-ton 20x36 Baldwin Switchers.
3—Jordan spreaders excellent condition.
Located Mississippi valley. Box 2011-ME.

DRAG SHOVEL EQUIPMENT—consisting of 18' boom, 7'6" dipper handle and ½-yd. front-opening dipper suitable for application to Bucyrus-Erie 1020 shovel. Located Rhode Island. Box 2003-ME.

SURPLUS MINE EQUIPMENT BARGAIN PRICES

Write for prices of this equipment. Save money. Located in Minnesota.
5—Boilers, locomotive and horizontal return tube types, 150 H.P.
14—Flat cars, 36" gauge, 18-ton.
3—Crushers, jaw, 44x28, 36x24 and Universal.
1—Motor, 135 H.P. squirrel cage, 1150 r.p.m., 220 v., 3 ph., 60 cy., A. C.; compensator.
3—Rotary converters, 300 Kw., HCC-6-300-1200, Forms P, D, & V, 6 and 3 phase.
1—Switchgear for 3-phase rotary converter, complete, semi-automatic.
3—Transformers, 300 Kw., 66,000 V. Primary, reconnected for 22,000 V. Primary.
1—Ainley placer gold machine, complete. 4-bowl with feed hopper for dragline operation. 40-50 tons per hour.
3—Hoists, double and single drum.
1—Bucket loader.
8—Pumps, steam (1 gas engine driven) from 49 to 3700 g.p.m.
1—Tractor, Twin City No. 12-20.
1—Water softener, 5 ft., complete.
120—Batch boxes, oak, 55 cu. ft.
2—Drums mine hoist, dia. 50", width 40", flange 7", capacity 400' one-inch rope.
Box 2145-ME.

BLAST-HOLE DRILLS

14—Sanderson-Cyclone Model 14, non-traction—six Model 14-SR, traction type, electric blast-hole drills. Also six Loomis Clippers—Models 4 and 44, steam traction. All in good condition, available for immediate shipment. Located New York. Priced to sell. Box 2167-ME

WANTED

WANTED: Small Diesel or Gas dragline and shovel, complete for $1,000.00 cash. O. M. Fredd, Hancock, Mich.

FAIRBANKS-MORSE Diesel engine, Type Y, 14x17, 2 cylinder, of late design. In answering give condition, serial number, approximate location, lowest cash price. Box 2195-ME.

COMPLETE FRONT END ATTACHMENT for Lorain 75-B, 1¼ or 1½ yard. Must be in good condition. Write fully. Box 2196-ME.

SHOVEL FRONT END, including boom, handles, and dipper, for Marion Type 7 crane, shop number in 5700's. Will trade 40 foot crane boom and ⅞ yard bucket. Write full particulars. Box 2197-ME.

ROLLER, 5-ton gas tandem. Must be in good condition. Box 2199-ME.